NEW ZEALAND JOURNAL OF

Agriculture

JANUARY · 1949

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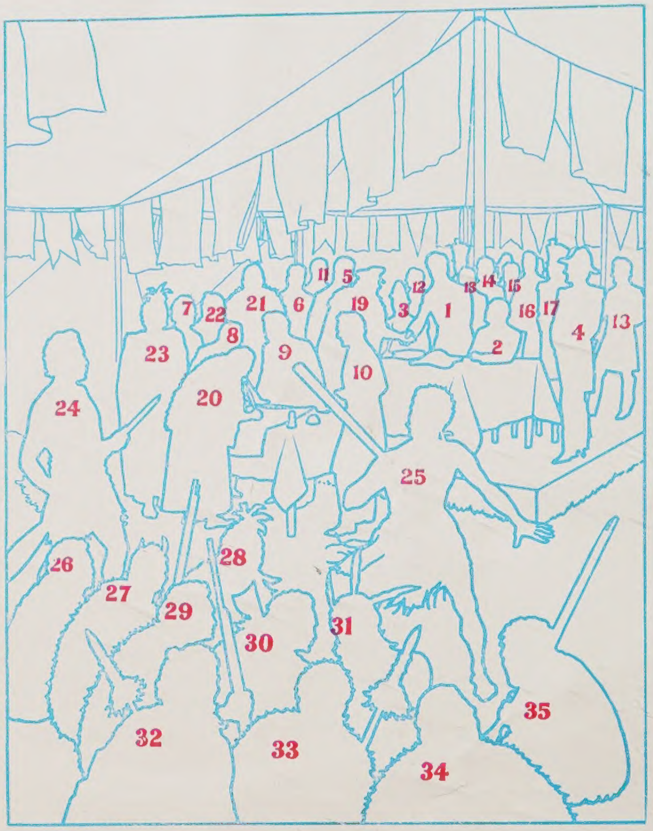
KEY TO THIS MONTH'S COVER

This month's cover depicts the signing of the Treaty of Waitangi on February 6, 1840, at Waitangi, Bay of Islands. The key to the identity of the principal characters taking part in the signing of the Treaty, shown in the facsimile below and in the outline reproduction on the right, is as follows:—



1. Captain William Hobson, R.N. (Lieutenant-Governor).
2. Mr. James Busby (British Resident).
3. Captain Joseph Nias, R.N. (H.M.S. Herald).
4. Lieutenant Willoughby Shortland, R.N.
5. Reverend Henry Williams (interpreter).
6. Mr. William Colenso (printer and observer).
7. Reverend Samuel Ironside (witness).
8. Mr. John Mason (witness).
9. Reverend Richard Taylor, M.A. (witness).
10. Mr. James Stuart Freeman (witness).
11. Mr. Johnson (interpreter).
12. Mr. George Clarke.
13. Mr. Samuel Grimstone (clerk).
14. Mr. Charles Baker.
15. Mr. John King.
16. Mr. Felton Mathew (Surveyor-General).
17. Lieutenant Smart (28th Regiment).
18. Mr. George Cooper (Treasurer).
19. Hone Heke.
20. Kawiti.
21. Tamati Waaka Nene.
22. Patuone.
23. Hakitara.
24. Tareha.
25. Marupo.
26. Rawiri.
27. Wharerahi.
28. Rewa.
29. Moka.
30. Te Kemara.
31. Tamati Pukututu.
32. Hakiro.
33. Matiu.
34. Pumuka.
35. Ruhe.

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The cover has been reproduced from an original painting by L. C. Mitchell, Wellington, who was required to undertake considerable research to produce this portrayal of the scene.

Appreciation for assistance in supplying information and checking details of the painting is expressed to Mr. C. R. H. Taylor, of the Turnbull Library, Mr. W. S. Wauchop, of the General Assembly Library, Lieutenant-Commander P. T. Williams, R.N., Mr. E. H. Biggs, C.C.O., R.N.Z.N., and Captain W. W. Stuart, of the Marine Department. Great assistance was also given by the late Mr. Kingi Tahiwi.

Volume 78
Number 1
January 15,
1949.
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

Published by
Direction
of
Hon. E. L. Cullen,
Minister of Agriculture.

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SUBSCRIPTION RATES

The "Journal" is issued monthly. The subscription within New Zealand is 2s. 6d. a year; the overseas subscription is 5s. The "Journal" may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture. Individual copies are available at 3d. a copy, post free.

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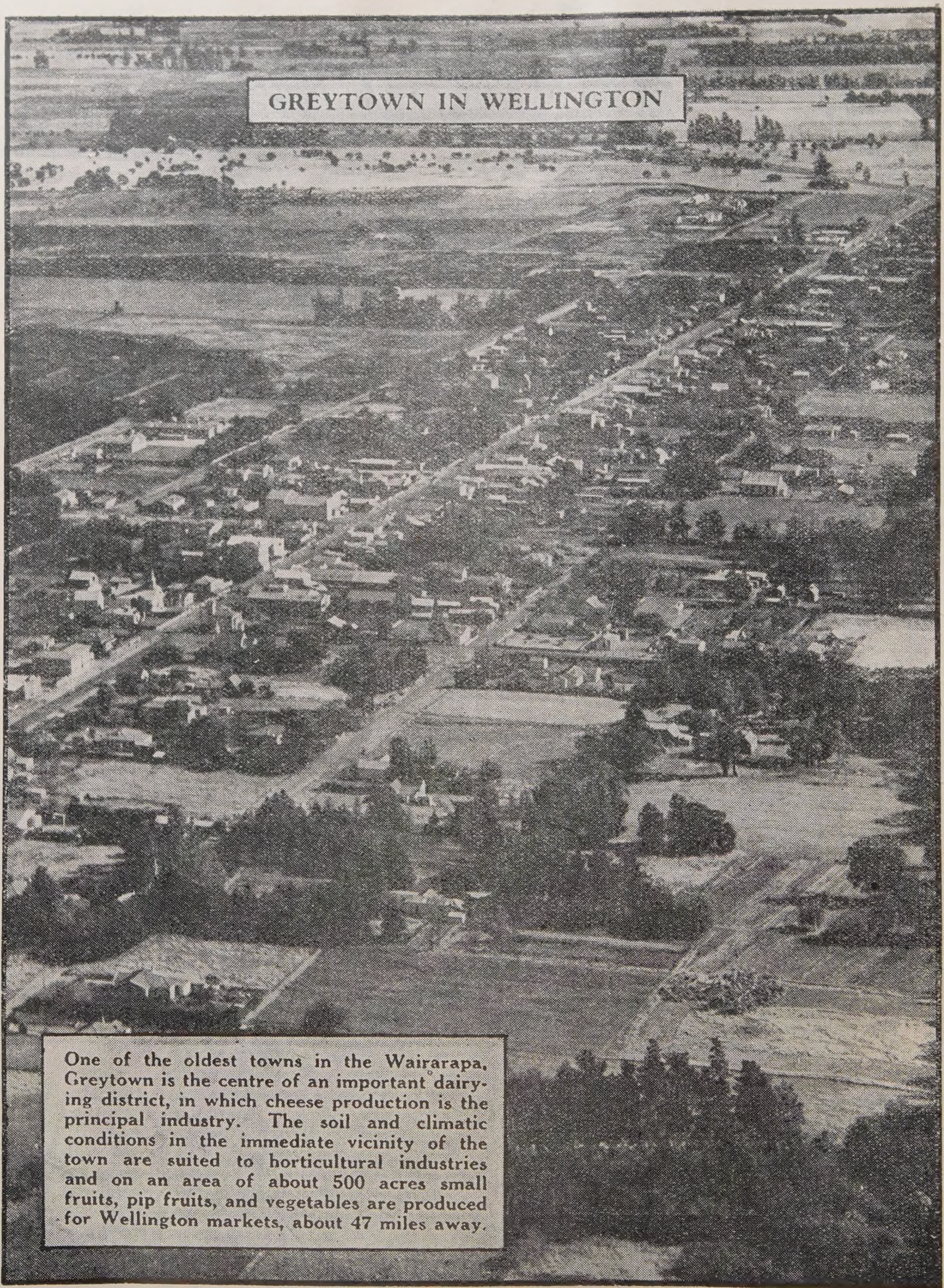
GREYTOWN IN WELLINGTON



One of the oldest towns in the Wairarapa, Greytown is the centre of an important dairying district, in which cheese production is the principal industry. The soil and climatic conditions in the immediate vicinity of the town are suited to horticultural industries and on an area of about 500 acres small fruits, pip fruits, and vegetables are produced for Wellington markets, about 47 miles away.

[V. C. Browne photo.

PRODUCTION PROGRAMME FOR 1949-50

WITH a farm economy dependent, as ours is, on livestock production, programmes for the future do not possess quite the same measure of realism as in countries where cereal and other cash crops constitute the bulk of primary production. Furthermore, New Zealand does not have the planned farm production programmes which obtain in the U.S.A. under the Agricultural Adjustment Act.

Nevertheless, as far as livestock production is concerned we have a definite goal to achieve. Under the renewed bulk purchase contracts signed in London last year undertakings were made to increase the quantity of meat and dairy produce supplied to the United Kingdom during the next 7 years. These increases are of the order of 50,000 tons per annum of beef, mutton, and lamb by 1954-55 and a gradual increase in butter and cheese supplied, reaching a level, by the same date, of 20 per cent. above the quantities supplied in 1947-48.

When consideration is given to some of the remarkable production achievements of our farmers in the past, for instance during the war when supplies of materials and labour were acutely short, the task may not seem such a very formidable one. There are, however, a number of factors which will increase the difficulties of obtaining the objective.

First, because of our rapidly-increasing population, food requirements of our own people are absorbing an ever-larger proportion of total primary production. Again, farmers are still working under difficulties of supply of essential materials, especially fertilisers, fencing wire, and building materials. The Government is fully aware of the importance of obtaining these commodities, but unfortunately factors outside its control are limiting the availability of supplies, mostly from overseas sources. As farmers are aware, however, supplies of fertiliser are greatly improving and the number of tractors imported in 1948 and expected in 1949 should go a long way toward meeting the urgent need for draught power.

Finally it must be remembered that the era of rapid expansion of production by the breaking in of virgin land is nearing its end. Undeveloped land which remains is mostly of inferior quality and requires more intensive effort for its development. In any case, over the short-term period the major part of production increases must come from farms already in production.

On many of our dairy farms there are areas where the pastures have run out and the laying down of these with Certified strains of grasses and clovers would return manyfold the cost involved. A large proportion of our surface-sown hill country, much of which has declined in carrying capacity over the years, could have its production increased by oversowing clovers accompanied by topdressing.

Pig meats were not included in the 7-year contract for other meats. The contract for pig meat runs to 1952, after which the quantities will be subject to review on 2 full years' notice. This does not mean, however, that there is not likely to be a market for all the pig meats we can produce for Britain. Our natural advantages in pig meat production are such that we should be able to supply the London market at lower prices than our competitors. Because of factors outside our control pig numbers have declined in recent years. The marked increase in the local consumption of whole milk and the expansion of the processed milk industry generally have reduced supplies of skim-milk and farmers have had difficulties in obtaining cereal feeding stuffs. There are indications, however, that the supply of coarse grains will be much improved this year, and I feel sure that those farmers who have not been taking a very active interest in pig meat production in recent years will, for the 1949-50 season, review the position with the idea of recommencing this very profitable sideline.

Latest available statistical information of world grain production indicates a very large measure of improvement in 1948 over 1947. The Food and Agriculture Organization has estimated the gap between requirements and supply at 4½ million metric tons. The actual deficit in bread grains is, however, somewhat greater, approximately 5¼ million metric tons—but there is a small surplus in the supply of coarse grains. Although this news is very heartening to a hungry world, it must be qualified by some consideration of the long-term situation. Reports indicate that the improvement is largely due to the favourable European harvest in 1948. With the world's population increasing at its present rate a poor harvest in the future would again result in serious shortages in the importing countries. For this reason I would urge farmers to plant as large an area of cereals, and particularly of wheat, as possible. With our present concentration on production of livestock products for Britain it is not perhaps desirable that we be entirely self-supporting in wheat supplies, but for all that it should be possible to grow not less than 250,000 acres of wheat annually without endangering supplies of livestock products.

To meet the required increases in exports steady and determined efforts to build up our livestock herds and flocks, to improve their quality, and to make maximum usage of available feed supplies will be essential. Farmers have security of markets for a reasonably long period at prices which are ample to meet production costs and which cannot vary substantially from year to year. I feel sure that with the steady improvement in supplies of the main factors of production, a response in keeping with our responsibilities and obligations is certain to be made.

EDWARD CULLEN, Minister of Agriculture.

BOOK REVIEW

Hormones and Horticulture: G. S. Avery, jun., E. B. Johnson, R. M. Addoms, and B. F. Thomson.

ALL interested in modern agricultural science will welcome this comprehensive summary of recent developments in the discovery and use of growth-controlling hormones. The authors have set themselves a formidable task in bringing together in one volume the mass of literature on the subject that has become available from hundreds of research workers in the field. Though this has resulted in some sections of the work being rather inadequately covered, in the main the book is surprisingly complete and the copious lists of references given provide directions to those who desire more adequate information on any particular aspect.

The book has been written primarily for the agricultural scientist and student, but the practical horticulturist and farmer will find complete information about all types of hormone applications which they can translate into practice. Where the authors are in doubt about the efficacy of a material they do not hesitate to say so. If read carefully, the book should do much to dispel many misconceptions about the use and usefulness of hormone materials.

—P.B.L.

McGraw-Hill Book Co., Inc. (New York).

◆

Shortage of Fencing Wire Expected to Ease by June

ADVICE that unless anything unforeseen happened it was expected that all fencing wire shortages would be overtaken by June has been received by the Aid for Britain National Council from Wire Distributors Ltd., according to a statement made by Mr. F. P. Walsh, chairman of the council. This information, said Mr. Walsh, would be good news for farmers anxious to bring new land into cultivation or to subdivide their holdings in order to increase their production.

A shipment of 2427 tons of all kinds of wire, principally from Belgium, arrived last month by the Kaikoura. The quantities of wire booked for shipment to New Zealand or already landed were as follows:—

	tons
No. 8 gauge, plain, galvanised wire	10,158
Other gauges	2,337
Barbed wire	10,405
Hay baling wire	2,188

The whole of these orders for wire had already been shipped or booked for shipment by the end of March, and supplies were now coming forward in satisfactory quantities.

Mr. Walsh said that Wire Distributors Ltd. had stated that they were now booking orders to cover requirements for the first half of 1949, which totalled 9935 tons. This quantity was made up as follows: 6554 tons of No. 8 gauge, plain, galvanised wire, 749 tons of other gauges, and 2632 tons of barbed wire.

◆

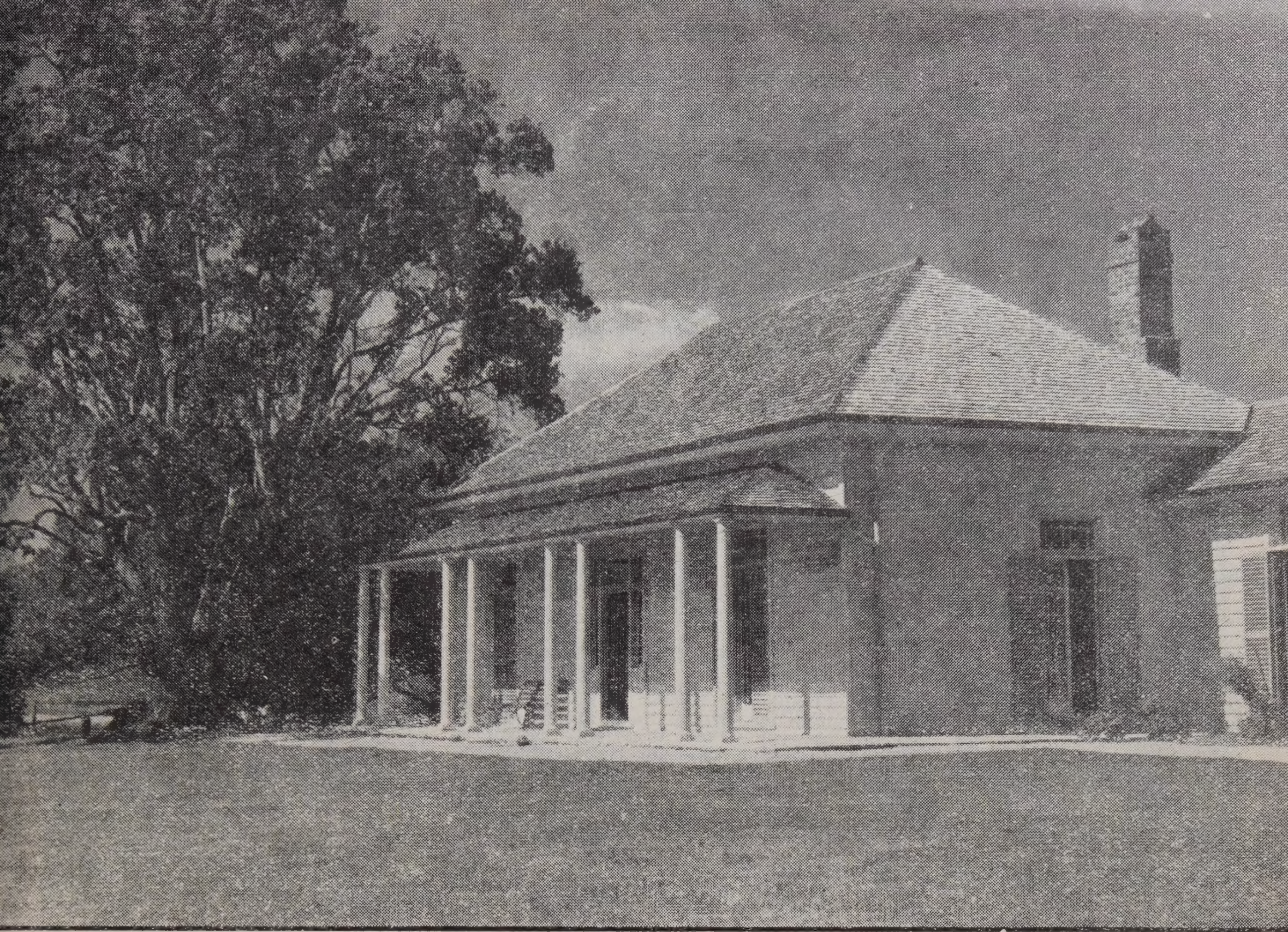
METEOROLOGICAL RECORDS FOR NOVEMBER

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Mean		Absolute maximum and minimum					Maximum fall		
		Approx.	Difference from normal	Maximum	Minimum	Total fall	No. of days of rain	Difference from normal	Amount	Date	
Auckland	160	61.0	+ 0.8	74.8	48.0	5.70	15	+ 2.24	2.10	19	209.0
Tauranga	10	58.5	— 0.3	73.9	39.2	4.94	19	+ 1.60	0.93	10	230.7
Ruakura	131	57.4	— 0.6	73.0	39.0	4.63	18	+ 0.93	0.74	10	222.9
Rotorua	980	56.6	+ 0.1	81.0	35.0	5.81	16	+ 1.63	1.46	20	192.3
Gisborne	12	59.8	+ 0.1	78.4	41.9	5.34	16	+ 2.95	2.03	17	191.0
New Plymouth	160	56.6	— 0.3	68.4	42.0	3.86	13	— 0.85	0.66	13	213.8
Napier	6	59.5	— 0.3	82.3	41.4	2.80	13	+ 0.75	0.81	14	196.6
Taihape	2157	52.9	+ 0.4	73.0	35.2	3.61	17	+ 0.29	0.71	14	
Wanganui	72	57.4	— 0.3	76.5	43.2	3.48	13	+ 0.57	0.95	14	218.0
Palmerston North	110	57.0	0.0	75.0	38.5	3.62	19	+ 0.35	0.58	14	191.6
Waingawa	350	54.8	— 1.3	73.0	36.5	5.04	17	+ 2.60	0.96	14	175.8
Wellington	415	55.2	— 0.4	71.2	41.4	4.27	12	+ 1.09	0.88	13	189.1
Nelson	24	56.6	— 0.6	69.9	39.0	3.19	14	+ 0.25	1.42	21	211.0
Blenheim	12	56.3	— 1.7	77.1	35.7	2.69	11	+ 0.91	0.58	21	217.3
Hokitika	12	53.0	+ 0.1	66.6	33.1	8.12	13	— 2.42	2.93	2	211.3
Hanmer Springs	1225	52.1	— 2.0	75.0	33.0	6.69	16	+ 3.22	1.30	13	155.5
Christchurch	22	55.8	— 0.5	82.5	36.7	2.35	11	+ 0.55	0.62	20	191.4
Ashburton	323	54.6	— 0.7	79.0	31.0	3.59	14	+ 1.16	0.71	16	167.2
Timaru	56	56.2	+ 0.6	87.2	36.2	3.25	15	+ 1.31	0.80	23	209.2
Alexandra	520	55.8	— 0.6	78.1	33.8	1.31	11	+ 0.15	0.38	1	210.2
Taieri	80	52.2	— 1.2	79.9	29.5	3.69	15	+ 1.34	0.57	9	
Invercargill	32	51.9	— 0.4	75.0	33.0	2.70	13	— 1.31	0.70	1	205.1

Fruit Crop Estimates for December, 1948

THE following estimates of the fruit crop for December, 1948, in 000's of bushel cases, are provisional and revised monthly for the period November to March and are summarised from information supplied by field officers of the Horticulture Division, Department of Agriculture.

FRUIT	DISTRICT									
	Auckland	Gisborne	Hawke's Bay	Manawatu Wanganui	Wairarapa	Nelson	Marlborough	Canterbury North Otago	Central Otago	Total
APPLES—										
Ballarat	40	8	50	1	1	7	5	8	2	122
Cox's Orange Pippin	8	3	50	1	1	9	9	12	11	104
Delicious	26	5	80	2	5	118	17	21	45	319
Dougherty	17	5	50	—	—	21	2	—	—	95
Granny Smith	53	2	90	2	2	56	1	2	3	211
Gravenstein	23	—	30	—	—	37	1	1	—	92
Jonathan	10	—	40	—	1	205	17	14	21	308
Sturmer	5	5	170	5	13	284	23	45	30	580
Other varieties	79	4	132	4	3	195	17	44	39	517
Total	261	32	692	15	26	932	92	147	151	2348
PEARS—										
Beurre Bosc	3	—	3	—	—	3	—	—	—	9
Louise Bonne de Jersey	—	—	12	—	—	—	—	—	—	12
Packham's Triumph	5	—	4	—	—	2	—	—	—	11
P. Barry	4	1	11	—	1	3	—	1	—	21
W. B. Chretien	17	—	40	—	—	25	—	2	6	90
Winter Cole	1	1	45	—	1	20	1	5	2	76
Winter Nelis	—	1	40	—	—	8	—	1	4	54
Other varieties	18	1	7	2	—	13	1	6	5	53
Total	48	4	162	2	2	74	2	15	17	326
OTHER FRUITS—										
Peaches	39	6	260	1	—	49	4	7	87	453
Apricots	1	—	2	—	—	—	—	8	116	127
Nectarines	1	1	25	—	—	1	1	2	18	49
Plums	9	6	43	1	—	5	1	6	21	92
Cherries	—	—	1	—	—	—	1	2	8	12
Quinces	9	1	9	—	—	9	—	—	1	29



WAITANGI—MAGNA CARTA OF MAORI LIBERTIES

MANY years before 1840 the advent of British sovereignty to New Zealand was inevitable. In this remote and beautiful group of islands two races were already in a tragic conflict. The worst elements of the stronger nation were reacting upon all that was good in the weaker, whose extinction was likely to be the outcome.

Early in the nineteenth century sealers and whalers had already established themselves around Foveaux Strait and planted vegetables. In 1814 Samuel Marsden settled a mission of artisans in the dense population of the far north. The human weakness of Thomas Kendall ruined this effort. Persevering against all difficulties, Marsden sent across in 1819 an ordained minister, John Gare Butler. He it was who in 1820 drove the first plough in New Zealand soil. Meanwhile the tall timber in the forests, the whales and seals in Pacific waters, the acres of wild flax, and the health-giving climate brought more pakehas here. Often cruel and immoral, they cheated and debauched both sexes, and frequently carried Maori men and women forcibly to the ends of the earth.

Against such treatment the Maori indignantly retaliated. Aggrieved whites then called upon the British Navy for protection, and punishment fell upon innocent and guilty alike. The Boyd was sacked at Whangaroa in 1809 because the captain had ill-treated a chief's son. Angry whalers, mistaking the name of the injured chief, wiped out the hapu at Bay of Islands of a man who had consistently protected the whites. In Taranaki a tribe which had given sanctuary to the castaways from the Harriet was mercilessly shelled by the guns of H.M.S. Alligator. At Kapiti a trading captain, Stewart, in return for a cargo of flax, handed over to the ovens of Te Rauparaha a South Island chief and his followers whom he had enticed to board his ship at Akaroa. Thus in a sad sequence each party sought revenge for the initial crimes of the white men. Only very slowly, through the protests of Marsden and others, did the truth filter through to the officials at Whitehall.

THE signing of the Treaty of Waitangi, perhaps as great an event in the history of New Zealand as the signing of Magna Carta was in that of Britain, took place just over 100 years ago, which is not a long distance back on the road of world history. Yet of this event of such significance to both races in New Zealand, though it took place in comparatively modern times, there are many popular misconceptions. What is believed to be an authentic pictorial presentation of the scene at the signing of the Treaty is reproduced on the cover of this issue, and in this article G. H. Scholefield, C.M.G., O.B.E., D.Sc., formerly Librarian of the General Assembly Library, Wellington, summarises the recorded history leading up to the drafting of the Treaty and describes events at the signing.

BRITISH RELUCTANCE TO COLONISE . . .

In 1825 a plan for organised colonisation was conceived. It was the two ships of the New Zealand Land Company that uncovered the bright prospects of Otago, Port Nicholson, and Hokianga, but they departed faint-hearted. For 6 years in the thirties a civil official at Bay of Islands, James Busby, tried to assert his authority through moral influence, the good will of the missionaries, and occasional visits of warships. Year by year the whites were harder to control. The firm hand of Maori authority, weakened by tribal wars and pakeha infiltration and disarmed by missionary teaching, was no longer effective. Yet what would it avail to teach the Maori to plough and plant, to read and write if the nation which offered such rich knowledge could not restrain its own people from the vilest outrages?

Britain Gradually Committed

In spite of official reluctance retarding every step toward British sovereignty in the Pacific, the Government gradually became committed to it. The coasts had been explored by British seamen, the forests were supplying British ships with spars, and the climate was attracting soldiers and officials from the British dominions in the East Indies. When a substantial private enterprise planned to colonise New Zealand by English men and women the old rivalry with France intruded. These British venturers might have been left to their own resources but for the threat from across the Channel. Now at last Downing Street, so long deaf to the wrongs of the Maori, could no longer pretend indifference. Lord Normanby acknowledged sorrowfully that "circumstances beyond our control have at length compelled us to alter our course, yet I do not scruple to avow that we depart from it with extreme reluctance." That is the best answer to the charge often levelled against England that the motive in Christianising and policing the Pacific was acquisitive. Compelled by public opinion, the Colonial Office agreed in May, 1839, to send as consul to New Zealand Captain William Hobson, R.N.

When Hobson arrived at Bay of Islands the New Zealand Company's emigrants were already landed in their hundreds at Port Nicholson, and Colonel Wakefield had made what he considered valid purchases of land all over the North Island. French and American warships on scientific research were hovering about the coasts, and a French corvette was under orders to protect French interests.

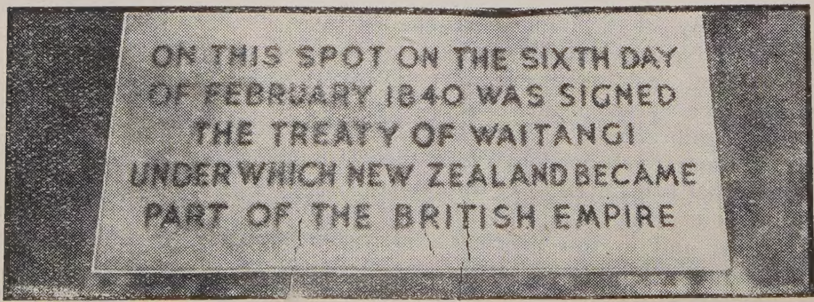
Good Men and Bad

And so in the beginning of 1840 were centred in New Zealand the vested interests of missionaries and traders, whalers and sealers, grogsellers and land sharks. A fleet of Australian brigs was busy around the coasts with greedy speculators and attorneys on board. Blank forms of feoffment to be filled in with due "considerations" of guns and blankets and rum were ready to be signed and witnessed by boatswains, supercargoes, and even by adherents of the missions. Into this crucible at Bay of Islands in January, 1840, were decanted all the schemes and aspirations, high policy and low cunning, passions and ideals of good men and bad. God grant that it might be for good. At worst it would be the end of chaos and outrage.

Three men co-operated in chief in the instrument which brought New Zealand within the British Empire. Lieutenant Henry Williams retired from the British Navy after the fight between the President and the Endymion, read for Holy Orders, and came to New Zealand in 1823 to salvage the wreck of Marsden's first mission. With stout heart and unflinching courage he softened the barbarity of tribal wars, spread the gospel over half the North Island, and gained a unique mastery over the Maori mind. James Busby, arriving as British Resident in 1833, tried to control without force a crowd of outlaws and loose-living whites from the whaling grounds. He did bring to the Maoris their first ideas of ordered intercourse. The third, William Hobson, a sailor who had rendered good service against West Indian pirates, had been sent in 1837 from the East Indies to report on New Zealand and had proposed a factory system of settlement on the East India Company's model.

Hobson's Commission as Consul

The task which fell upon these three was clearly outlined by the Secretary of State. Having recognised the independence of the New Zealand chiefs as set forth in Busby's Declaration of Independence in 1835, the British Government could present Hobson to them only as a consul, whose **"first object is to obtain from** the native chiefs a cession to Her Majesty of certain parts of those islands, which it is proposed should be added to the Colony of New South Wales as a dependency, when Captain Hobson would assume the character of Lieutenant-Governor."


ON THIS SPOT ON THE SIXTH DAY
OF FEBRUARY 1840 WAS SIGNED
THE TREATY OF WAITANGI
UNDER WHICH NEW ZEALAND BECAME
PART OF THE BRITISH EMPIRE

The commemorative tablet at the foot of the flagpole on the lawn at Waitangi House.

In the event Hobson did not use his commission as a consul. The reason was probably the least valid upon which this high-souled man ever acted. Two Irish post-captains, Hobson and Nias, grated upon each other's nerves throughout the voyage from Port Jackson. Long before the Herald tacked into Bay of Islands Nias was damned if he would accord to Hobson a lieutenant-governor's salute when he landed. They both knew that Hobson could land in an independent state only as consul. Since the Herald was his ship and he would give orders, Nias had the last say. As for hoisting a pennant as a signal to Busby to come aboard, Hobson could find some other way of summoning him.

On the following day (January 30) Hobson landed on the beach at Kororareka to a consul's salute of 11 guns. With Busby and a small crowd of white settlers they walked up to the church and there Hobson read the Queen's proclamations, one extending the limits of New South Wales to include such territory in New Zealand as might be acquired and the other—in spite of the four guns short in the salute—appointing him Lieutenant-Governor. During the next few days these three—Hobson, Busby, and Williams—with the assistance of Maori scholars, composed, revised, translated, and retranslated the document which it was proposed to submit to the Maori chiefs at a huihuinga (or, as Busby preferred to call it, a wakaminenga) of chiefs. Meanwhile on the slope in front of the Residency sailors of the Herald erected a marquee 150ft. by 30ft. and a number of smaller tents.

1500 Maoris and Pakehas

On the morning of Wednesday, February 5, there were assembled at Waitangi about 1500 Maoris and pakehas. At a levee at the Residency many of both races were presented to Hobson. These included the French Bishop Pompallier, who arrived during the morning. The Wesleyan missionaries from the Hokianga River stations did not reach Waitangi till the afternoon, but were in time to hear the purport of the debate.

Treaty Hammered Out

At noon the levee finished and Hobson and Nias, arm in arm, led the procession across the greensward to the marquee. The Treaty was read and explained to the 600 people who could find room in the marquee, and more than 3 hours were occupied in explaining points, answering questions, and meeting arguments. It was a colourful scene at which this epoch-making Treaty was hammered out on the anvil. Descriptions recorded by eye-witnesses differ in some important points. Several who were afterwards high in the councils of New Zealand unfortunately did not think to put into writing what they saw. Daniel Pollen (afterwards Premier) was there, still wondering whether he should go back to Australia or Ireland, whether he should practise as a doctor, or what. William Brown, a **Scots** merchant, knew what he was going to do, but he did not know that he and his partner John Logan Campbell would both be superintendents of Auckland Province. Gilbert Mair, another Scot, could remember distinctly the scene at the signing of Busby's Declaration of Independence, the fons et origo of all subsequent negotiations. Benjamin Evans Turner, castaway in the south in 1822, the first white dealer in Maori heads, was now president of the Vigilantes, who tried to keep order in Kororareka. He could not have predicted it himself, but people who knew him were not surprised when he fought a duel with J. S. Polack or when he became member of the Provincial Council.

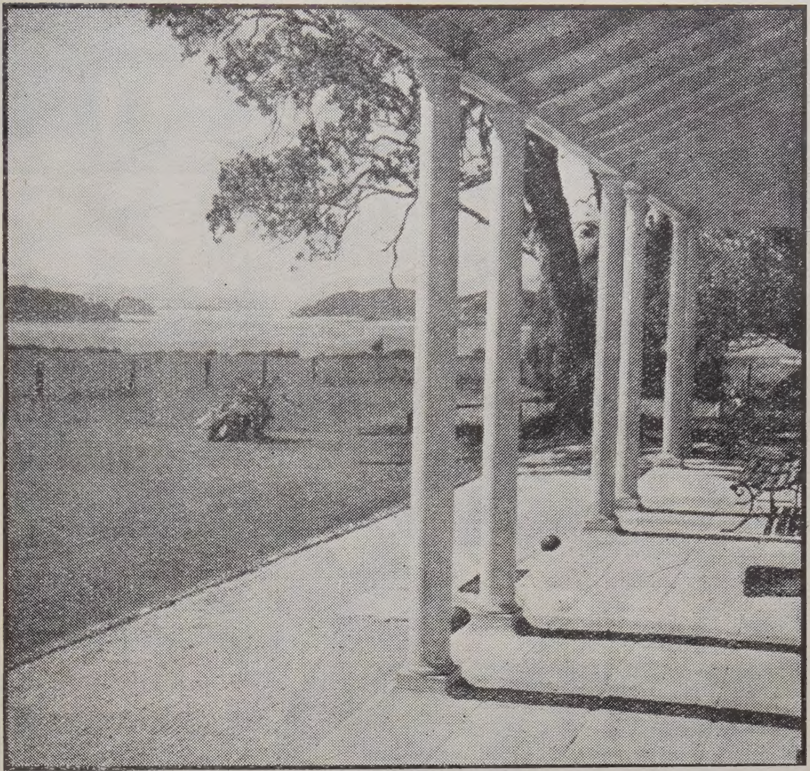
Early in the debate Hobson's hopes must have quailed as chief after chief, of high mana, tattooed and scarred from the wars, rose to protest against the cession. Rewa, Te Kemara, Moka, Tareha, and Kawiti said: *"No Governor for me. Go away, Governor."* Some of them, speaking figuratively, left it open to the interpreters to hearten Hobson with a favourable translation. It was thus with Hone Heke, but there was no duplicity about Kawiti. His stern spirit rebelled against restrictions. *"Even I, Kawiti, must not paddle this way or that because the Governor said No."* The tide turned upon the speeches of two brothers, the venerable Tamati Waaka Nene and Patuone, powerful chiefs of Ngapuhi and trusted friends of the missions. Yet when the hui broke up at 4 p.m. the issue was still in doubt. Factious whites had challenged this clause and that and it was obvious that no decision could be reached until the natives had held their traditional debate upon the marae or round their own fires.

Hui Dissolved

Anxious that nothing should be decided impulsively, Hobson adjourned the debate for two days hence. So the hui dissolved, the chiefs and their parties separated, and the whites strolled down to the grogshops to exchange views and innuendo about Hobson and his officials.

Economic forces brought a happy solution of Hobson's doubts. The chiefs, summoned at short notice, had set out with their followers without any store of provisions. It was beyond the power of the local chiefs to entertain so many visitors from their own supplies. If the debate did not resume before Friday they would be without food, and a hui without food was unthinkable. There was only one solution. They must sign the Treaty tomorrow. Everyone on shore knew that this had been decided, and all went late to sleep.

Hobson, exhausted with the long debates of the 5th, intended to spend the next day on board the Herald, and in the morning he dressed himself in civilian clothes. When the crew of the ship's boat on a shopping errand learned that the Maori chiefs wished to sign the Treaty that day they pulled hastily back to inform Captain Hobson. Realising at once the urgency of the summons and fearing that many chiefs might go off home without signing, he did not wait to change into uniform, but snatched up a naval hat and wore it with his civil clothes.



View across Bay of Islands from the British Residency at Waitangi. The Residency is also shown in the heading illustration of this article.

Scene at the Signing

It is the scene at Waitangi this morning (Thursday, February 6), when the first signatures were affixed to the Treaty, that the artist (Mr. L. C. Mitchell) has chosen for the subject of the cover of this month's "Journal." The gathering, though less numerous than on the day before, was dignified and colourful. Hobson in his grey suit behind the table is shaking hands with Heke (in white cloak and naval cap), who was the first to sign. Behind Heke, bent over the table, the venerable Kawiti, his hands guided by the missionaries Richard Taylor and John Mason, makes his mark at the top of the column above Heke's. Supporting Hobson are the pompous Shortland, who was an administrator after his death, Busby (sitting at the table), and Williams, introducing Heke. Away to the left of these are the Ngapuhi stalwarts Nene and Patuone. In the foreground is a bright group of yesterday's disputants, Marupo, Moka, Te Kemara, and, most dramatic touch of all, the great chief Tareha, wearing a tattered mat and carrying a paddle and a bunch of fern root to signify the despoiled state of the Maori under British domination. Pompallier, satisfied that his interests were safe with Hobson, was not present.

And so the signing took place, the actual affixing of the first signatures that constituted the cession of sovereignty. Perhaps the missionaries, in whose houses he had lived as a youth and who knew the turbulent, ambitious spirit of Hone Heke, were not surprised by the ambiguity of his speech, nor 4 years later that he who first signed the Treaty should first break it. His triple assault on the flagstaff at Kororareka, the symbol of British sovereignty, culminated in the sack of Kororareka and the war in the north. Kawiti fought fiercely by his side, but there was no treachery in Kawiti. He had never bent his head. When the battles of Ohaeawai, Okaihau, and Ruapekapeka had been fought he yielded like a warrior and retired to his pa. Nene and Patuone, troubled in their hearts at the folly of the British soldiers, fought staunchly for the Queen. Four years later, when Sir George Grey was knighted, Nene was one of his esquires.

Magna Carta of Maori Liberties

Long years of misunderstanding, nearly three decades of war, followed the Treaty of Waitangi. Many times the disillusioned natives invoked its protection. Just as often they were grateful for its integrity. When all is said and done, it has been the sheet-anchor of their survival as a race and the Magna Carta of their liberties. As one writer has put it, "the brightest tradition of the New Zealand people today is the practical observance of a compact which has protected the Maori from himself and from the relentless ravages of civilisation, and has enabled him after 100 years to stand on a plane of equality with his white brothers."

ERADICATION OF TALL FESCUE

Upper left—In the clearing of tall fescue country the removal of a considerable quantity of willows is often necessary. Upper right—The willows are then heaped up and burnt. Middle left—The tall fescue is shaved off and put into windrows by a bulldozer or grader and left to dry for burning later. Middle right—A wide furrow is ploughed and turned over flat to bury tall fescue missed by the bulldozer. Lower—On soils that do not set hard, rolling follows ploughing.

Measures for Eradication of Tall Fescue

IN many parts of New Zealand tall fescue has virtually taken charge of partly-drained swamp country. The main principles for its eradication are dealt with in this article by S. H. Saxby, Agrostologist, Department of Agriculture, Wellington.

Typical swamp land growing tall fescue and willows.

TALL fescue (*Festuca arundinacea*) is a tall, tussocky grass with relatively-wide, harsh leaves and grows to a height of 4 to 5ft. It sets seed readily and increases rapidly by this means. It is widely distributed in New Zealand, being plentiful in many districts from North Auckland to Southland. Tall fescue thrives in damp soils, but will not live in permanent water; at the other extreme, it will live under extremely-dry conditions, but there it makes relatively-little growth and does not form large tussocks.

In many districts it is a serious weed, being relatively unpalatable, particularly to cattle; it is neglected by them and thereby allowed to increase until it becomes the dominant plant. Thus it reduces the carrying capacity to such a low level that land heavily infested with tall fescue becomes almost worthless in that condition.

Tall fescue also has the disadvantage of being poisonous to cattle. For many years tall fescue ergot has been regarded as the cause of extremities, such as feet, drying up and ultimately falling off. It has been established recently that the herbage is probably more poisonous to cattle than the ergot.

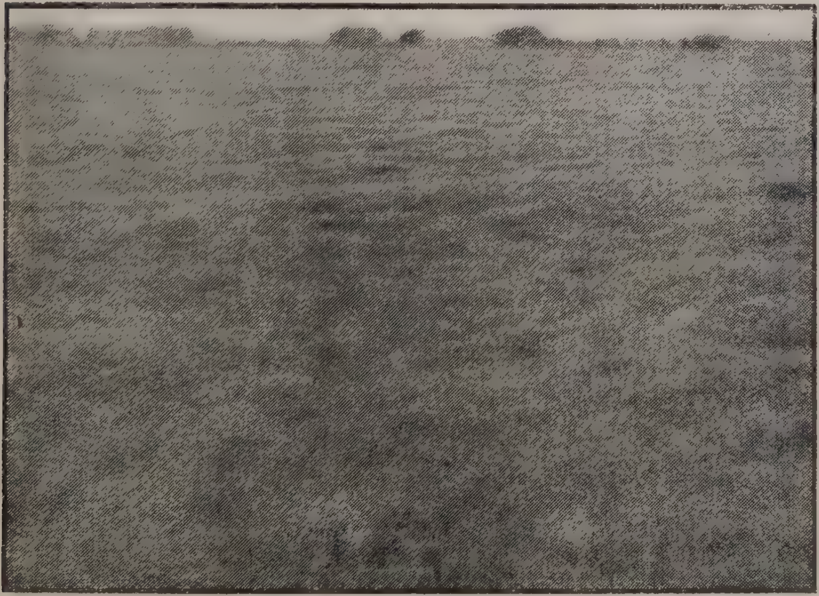
Tall fescue generally tends to take charge on swamp land that is in the process of being drained. It will not thrive in the natural, undrained swamp, but as soon as most of the surplus water has been removed the tall fescue comes in and in a comparatively-few years will take complete charge. On country that is well enough drained to hold a good ryegrass and clover pasture, tall fescue is seldom common. It is in the intermediate stage between swamp conditions and ryegrass-clover conditions that it is troublesome.

In recent years large areas of tall fescue country have been converted into valuable dairying land, but in many districts tall fescue is still a major problem. Its ingress, with the resultant lowered carrying capacity, allows other undesirable plants to grow and spread virtually unchecked. One of these is the common willow, which in the early days was planted widely in wet land. Consequently the bringing in of tall fescue country often involves the removal of a considerable quantity of willow as well.

Drainage and Clearing

In the control of tall fescue the first essential is the improvement of the drainage, without which its elimination is not likely to be permanent. Because of this its control is difficult in low-lying areas such as the Hauraki Plains. Marked success has been secured in districts such as Makerua in the Manawatu and the Taieri Plain in Otago, where extensive and successful drainage schemes have been put into operation. The type of drainage adopted depends on the nature of the country and the type of soil, but as a rule open drains are the most effective, particularly as the land is usually in too rough a condition to enable tiles to be laid.

Heavy machinery has proved of great value in clearing this country. When the drains have been put in, bulldozers are usually used to remove willows or old tree stumps, which are heaped up and burnt. Then the heaviest of the tall fescue is shaved off with a bulldozer or heavy road grader, left in long rows, and, when dry enough, burnt. That leaves the ground in relatively-good condition



Temporary pasture on land that previously carried tall fescue and willows.

Drainage is essential if the improvement is to be permanent.

for a swamp plough. The ground can then be ploughed 10 to 12in. deep with the furrow almost completely turned over. On swamps where the surface soil is rich in organic matter the ploughed land is usually rolled on the furrow, for rolling consolidates the ground, buries the tall fescue further, and makes subsequent working down easier. On heavy soils low in organic matter rolling may not be suitable immediately after ploughing and may have to be delayed until the furrow slices have dried out.

After being rolled the ground should be disced with very little cut, the object being to break up the soil and at the same time bring up as little of the buried turf as possible. Subsequent cultivation depends on conditions, but usually consists of harrowing and rolling until the ground offers a reasonable seed-bed. Rotary hoes have also been used with success on some small areas.

Sowing to Pasture

Though some areas have been sown down to permanent grass at once, that is not advisable. First, there is almost certain to be an appreciable growth of tall fescue from both seed and old clumps. Second, irrespective of how thorough the cultivation has been, the pasture is certain to be very uneven because of settling and the holes left by stumps and trees; such unevenness is most undesirable, particularly for drainage, laying of tile drains, and cutting hay or silage. Therefore, if pasture is required, a temporary mixture should be used consisting of 30lb. per acre of short-rotation ryegrass and 2lb. of white clover; 4lb. of red clover can be added if required. Such a mixture is particularly suitable where the area is to be grazed with sheep.

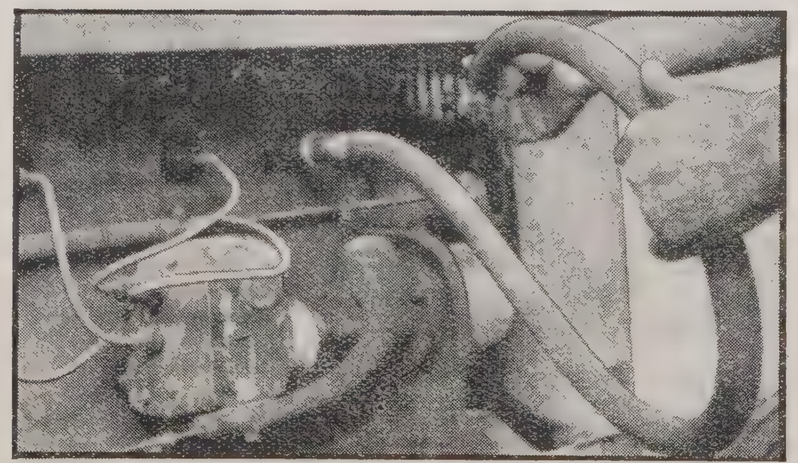
However, it is generally accepted that the best practice is to take two annual crops for feeding off and then sow to permanent pasture. The choice of crops will vary with the district and the type of farming. Rape, chou moellier, and millet have been found satisfactory.

When the permanent pasture is finally sown the following mixture of Certified seeds is suitable for much of the rich, one-time tall fescue country:

	lb. per acre
Perennial ryegrass	15
Short-rotation ryegrass ..	15
Timothy	6
White clover	2
Red clover	4
	42

◆

Quick Method of Cleaning Tractor Radiators



DURING harvesting operations, and particularly in sweeping hay, tractor radiators tend to become blocked with straws and dust. This, together with the fact that tractors are generally used for harvesting and hay sweeping on days when the temperature is high, causes overheating of the engine parts, with consequent rapid wear. Sufficient time cannot generally be spared in the harvest field to clean the radiator thoroughly, but a simple device seen on a farm in the Tirau district reduces the time needed to a few minutes.

The pressure created in one of the cylinders while the engine is running is directed through a short length of high-pressure hose and is used to blow all dust and straw from the radiator and around the engine itself. The hose attachment is made by removing the centre core from an old spark plug and screwing in its place a short length of piping over which the hose is clamped. To use the attachment, one spark plug is removed, the prepared plug screwed in in its place, and the engine started. Intermittent blasts of air are emitted, and these are directed toward the parts to be cleaned. The efficiency of the attachment warrants its more general use, especially now, when tractor replacements are so difficult.

—G. A. BLAKE, Instructor in Agriculture, Department of Agriculture, Matamata.

THE HOME GARDEN IN FEBRUARY

By A. G. KENNELLY, Instructor in Vegetable Culture, Department of Agriculture, Christchurch.

FEW gardens lack vegetables in February, and though crop plants still require such attention as watering and weeding and in most gardens some planting and seed sowing has to be done, the harvesting of a great variety of vegetables is usually the main feature of the month's work.

MARROWS, pumpkins, squash, cucumbers, tomatoes, onions, carrots, beet, turnips, radish, beans, and potatoes are available in most gardens; fewer gardens have such subjects as brussels sprouts, kumara, and celery ready. Garden work, however, is not finished because so many crops have been brought into bearing. The hoe should be used to keep down weeds. They are easily killed at this time of year, and though they can have little effect on the growth of crops that are mature or nearly so, if left, they soon scatter seed, from which plants grow and become a nuisance to succeeding crops. Seed of salad crops such as lettuce, spring onions, radish, mustard, cress, and endive and other crops such as turnips, beetroot, spinach, silver beet, and spring cabbage can be sown. Small sowings of dwarf beans, peas, and carrots can be made in favourable situations in very warm districts; cauliflower can also be sown. Kumara runners should be lifted to prevent their rooting and tall-growing tomato plants should be pruned and tied. Crops like celery and celeriac should be kept well supplied with moisture; brassica crops should be sprayed or dusted to prevent attacks of pests, and in susceptible districts tomato and potato crops should be sprayed or dusted as a precaution against pests and diseases. Ground not required for some time for cropping should be dug over and sown with a cover crop.

Asparagus

Fern growth of asparagus should now be well developed and in exposed gardens support is usually necessary. Stout string tied to stakes driven into the ground at 5 to 6ft. intervals is usually satisfactory. Weed control should not be difficult if the weather is dry, as most weeds are smothered by strong fern growth. Where weeds are troublesome they should be removed by hand to prevent their seeding. Beds should not be neglected because cutting is finished. If dry, they should be watered or irrigated, and though it is rather late, a fertiliser can be applied with advantage if none was given after cutting ceased.

There has been considerable research into the manuring of asparagus, and in general research workers agree that it is necessary to apply a complete fertiliser (one containing nitrogen, phosphoric acid, and potash), but there is some difference of opinion as to the best time to apply it. Advocates of an early-spring application usually favour in addition a dressing of nitrate of soda or sulphate of ammonia at the rate of 1 to 2oz. per square yard after cutting ceases. On most beds the actual time of application of a complete fertiliser seems to make little difference to production. If applied just before cutting, it can have little effect on the current crop; the important point is that a balanced fertiliser is available to enable the plant to build up food reserves from which good-quality spears can be produced.

[Green and Hahn Ltd. photo.

In exposed situations it is sometimes necessary to support asparagus fronds to prevent wind from damaging them. Stout string tied at 5 to 6ft. intervals will usually give the necessary support.

Chinese Cabbage

Chinese cabbage is a vegetable that deserves to be grown more in New Zealand. It somewhat resembles cos or romaine lettuce, but the size of its oval, elongated head is nearer that of Swiss chard. It is sometimes called lettuce-cabbage, as the texture of its leaves is more like that of lettuce than that of an ordinary cabbage. It is tender and quick growing and the commoner varieties mature in about 70 to 90 days. It should be treated like lettuce, but as it grows much bigger, it requires wider spacing. It is also known as celery-cabbage because of its flavour and because some of the forms rather resemble celery in appearance.

Where growing conditions are favourable in autumn plants can be matured before winter from a February sowing. Alternatively plants can be sown in spring, as Chinese cabbage usually does well in the cool conditions then prevailing. Seed can be sown in good soil in a sheltered situation or in boxes under glass 3 to 4 weeks before plants are required for setting out. Spring or autumn sowing is preferable in most districts, because if the weather is hot and dry, growth is slow and consequently the plants often fail to head properly, developing seed stalks instead.

Chinese cabbage stores quite well after cutting and may be eaten either cooked or raw. The inside blanched leaves and heavy but tender midribs have a delicate celery-lettuce flavour.

Seed should be sown ½in. deep in rows 18in. apart in a moist, well-drained soil that is very rich in humus. When the seedlings are 3 to 4in. high they should be thinned or transplanted 12in. apart in the rows.

Good varieties are: Wong Bok (Pao Ting), which is a short, quick-growing variety 9 to 11in. high and up to 6in. in diameter. Pe Tsai is a taller and thinner variety than Wong Bok with looser leaves. It stands dry conditions slightly better, but its flavour is not usually considered as good as that of the others. Chihli is a tall early variety 15 to 20in. high with a base diameter of about 3½in.

Endive

Endive belongs to the same genus as chicory. It is grown less in New Zealand home gardens than it is in home gardens of Western Europe, but it is well worth more general culture here. It provides an excellent substitute for lettuce because of its hardiness. Unlike lettuce, however, it is very bitter when full grown unless it is blanched. Blanching the broad-leafed varieties may be done by tying the leaves of the full-grown plant together at the top. Blanching takes about 3 to 4 weeks and is best done with the curled variety by covering the plants when they are dry with a box or pot with the drainage hole covered, though it is possible to blanch endive with clean straw or leaves. Blanching should not be commenced with most varieties until the plants are about 3 months old. Only a few plants should be blanched at a time, as endive begins to deteriorate quickly after blanching is complete. The leaves of young plants may be used raw for salads or cooked as a substitute for spinach.

There are two main types of endive—the round-leafed and the curled- or cut-leafed. The round- or broad-leafed Batavian variety is sometimes referred to as escarolle and is particularly hardy. It produces a broad leaf, toothed on the outside and slightly twisted, with thick ribs. It forms a fairly-compact heart which blanches to a creamy white and often attains a diameter of 18in. There are intermediate varieties between the broad-leafed and the fine-curled types, but the very fine curled varieties are most popular.

Curled varieties grow up to 20in. in diameter. They are a little less hardy than the Batavian varieties, but have a more attractive, rather nutty flavour. The leaves of some of the fine-curled varieties are very ornamental, as they are finely laciniated and the plants grow tufty and full in the centre with broad, white, fleshy midribs which branch readily. Varieties of endive may range in colour from white to green.

It is possible to have a supply of endive throughout the year if successional sowings are made. Except for blanching, cultivation is similar to that of lettuce. Soil should be well drained and rich in well-rotted organic manure and should not be permitted to dry out or to become excessively wet.

Seed should be sown ¼in. deep in rows 18 to 24in. apart and the plants later thinned or transplanted 12 to 24in. apart (according to variety) in the rows.

Herbs

A herb garden is always interesting. Though the times of maturity of herbs vary somewhat according to district and situation, there are a few that can be harvested in most gardens now. One of these is peppermint, which for distilling should be cut when in flower. Spearmint can also be gathered, though it is more usual to gather it as required during summer. The crop should be cut on a dry day when the plants are in flower and should be tied in small bunches and hung in a dry shed until the leaves have become brittle. Later they can be rubbed to a fine powder and stored in airtight bottles. Sage, too, can be gathered, though if desired, it can be gathered as it develops. Small shoots should be tied together and hung to dry and when ready the leaves can be stripped, rubbed fine, and stored in airtight bottles.

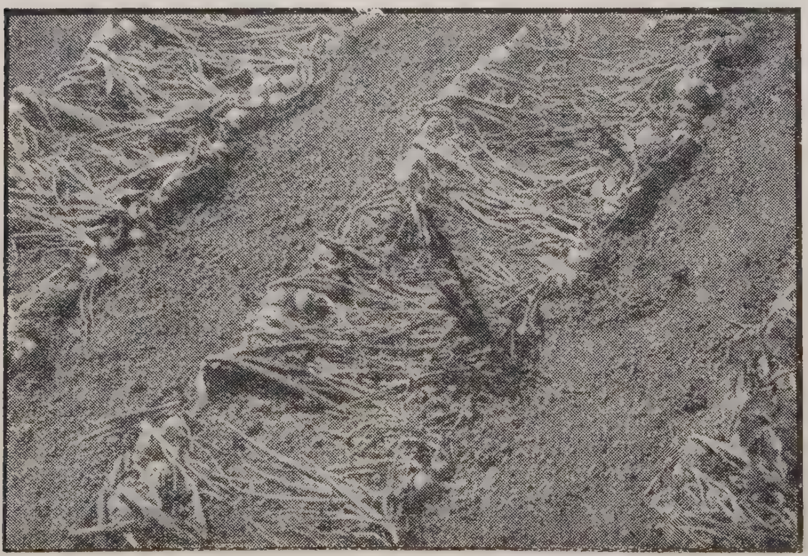
The leaves of clary (*Salvia sclarea*), a less common sage also known as "sweet sage," can also be gathered, dried, and stored similarly.

Coriander is a herb not seen much in home gardens now. The ripe seed should be dried in the sun and stored in stoppered bottles. The leaves can be used similarly to those of ordinary sage. The seeds are aromatic and useful for flavouring curries and stews. They can also be used in a number of other ways, including the flavouring of drinks.

Seed of such subjects as chervil (*Anthriscus cerefolium*) and purslane (*Portulaca oleracea*) can be sown. Both the common and curled chervil are used like parsley or for flavouring soups and stews. Soil should be light and fairly rich, though the plants grow well in either full sunlight or shade. Seed germinates readily, but unless the centre bud is nipped out, the plant goes to seed quickly if transplanted. Seed should be sown every month for best results, but in the colder districts it may be advisable in winter to sow it in boxes under glass.

Purslane deserves to be grown more often than it is, as it is easy to grow and the young leaves and shoots can be eaten cooked as a vegetable or raw as a salad. It is rather tender and requires a warm situation in full sunshine. A light soil is preferred. Clean and correct labelling is an important point which should not be overlooked when storing dried herbs in bottles.

It is very important to keep the herb garden free from perennial weeds. Convolvulus, oxalis, and couch grass, like other perennial weeds, should be removed before they are properly established.



Apart from variety and manurial treatment, the keeping quality of onions depends very largely on the care taken in harvesting or drying. A spell of fine weather is essential for the proper drying off of the bulbs unless a suitable drying shed or rack is available.

Onions

Most onion crops are mature by February. Harvesting can commence when the bulbs are firm with thin, dead, wiry roots and most of the tops are withered and tend to fall over naturally, but ripening is often uneven and onions that continue to grow strongly should be encouraged to ripen by bending the tops. This assists the drying of the bulbs and is always a good practice to adopt when onions have reached their maximum growth (about a fortnight before harvesting). It is usual to bend the tops of two adjoining rows toward each other.

Though the commercial grower often wheel-hoes his onions from the bed, in the home garden the onions can be pulled by hand; if they still have a fairly-firm hold when it is necessary to commence harvesting, the root can be cut with a sharp hoe. After lifting, the onions should be laid on their sides to dry. It is usually advisable to turn them several times so that they ripen evenly. Bulbs with thick necks that refuse to bend should be selected for early use. If the weather alternates between wet and dry, the onions should be lifted off the ground and spread to dry elsewhere.

Though manurial treatment and growing conditions are very important in producing good onions, their keeping quality will depend largely on the care taken in harvesting and drying. A spell of fine weather is essential unless suitable facilities such as a drying room are available. A home-made drying frame made with wire netting supported about 1ft. above the ground by pegs and covered with a sheet of corrugated iron or tin held about 3in. above the onions was illustrated in the January, 1948, "Journal." The onions are placed on the netting; the iron is quickly warmed during sunshine and the warm, dry air circulating about the onions dries and ripens them.

Parsley

Parsley is usually in constant demand and to ensure adequate supplies seed should be sown twice a year in most gardens, in spring and again in autumn. The plant is a biennial (that is, it goes to seed the second year), but unless conditions are especially favourable, germination is usually slow; if two sowings are not made, there may be a break in supply. Parsley responds well to rich, well-drained soils and where the soil is lacking in organic matter a dusting of blood and bone lightly forked in at the rate of 2 to 3oz. per square yard usually gives good results. Alternatively soils in reasonably-good condition can be dressed with sulphate of ammonia at the rate of about 1oz. per square yard. Seed can be sown in rows or broadcast on a small prepared plot, but for best results the plants should be spaced about 8 to 12in. apart when at the seedling stage. They make quite a good edging and do well in a cool, moist soil in the open or semi-shade. Parsley is a rich source of vitamins A and C. It is said to be fatal to small birds and parrots and poisonous to fowls.

There are several types of parsley, which may be grouped as follows:—

(a) **Plain-leafed or "Italian":** This is particularly hardy, but is rarely grown in New Zealand.

(b) **Fern-leafed:** The leaves of this type are deeply cut, but the segments are not twisted.

(c) **Curled:** This is the most popular type of parsley grown in New Zealand and most seedsmen's catalogues list varieties of it. The leaves are deeply divided into segments which are twisted or curled over.

Within these groups there are dwarf compact and tall varieties. In addition, the variety known as Hamburg is included with the coarser-leafed types. It has an edible root about 7 to 8in. long and about 3in. thick somewhat resembling a small parsnip in shape and colour. The roots are very tender when grown in a rich soil well supplied with moisture. The different varieties of parsley vary in colour from light to dark green. Tall varieties have about 7 to 8in. of stem and are suitable for bunching. The dwarf compact varieties, which may be only about 5in. high, are useful in the home garden.

If two sowings are made each year, there should be no need to dry or store parsley. Storing is, however, quite a simple matter. The most desirable dried parsley is obtained by constantly picking a few of the best young leaves as they develop in summer and autumn; spring-dried parsley rarely keeps its colour. The leaves can be laid out in single layers and dried in heated rooms, though most housewives will find it more convenient and the final product better if the leaves are dried at a temperature of about 90 degrees F. in a fairly-hot oven with the door open. Quick drying is imperative if the essential oils that give parsley its characteristic scent are to be retained and too much of its colour is not to be lost. When dry it should be rubbed or pulverised and coarse pieces of stalk should be removed. The leaves can then be put in bags and should be stored in a dry place. If allowed to re-absorb moisture, they tend to become rubbery in texture.

[Sparrow Industrial Pictures Ltd. photo.

To ensure adequate supplies of parsley, seed should be sown twice a year in most gardens, in spring and again in autumn.

Parsley is sometimes gritty with soil from rain splashes, but it should not be cleaned with boiling water. If it cannot be cleaned with a thorough shaking it should be washed under a cold tap.

[Sparrow Industrial Pictures Ltd. photo.

Potatoes that are still growing should be kept weed free and moulded so that exposed tubers do not become green and unpalatable. Spraying should be done regularly where conditions favour blight.

Because parsley is a biennial, it usually commences to send up seed stalks early in its second year. Little is to be gained, however, by picking them off, as the plant's energy becomes more and more concentrated on their production.

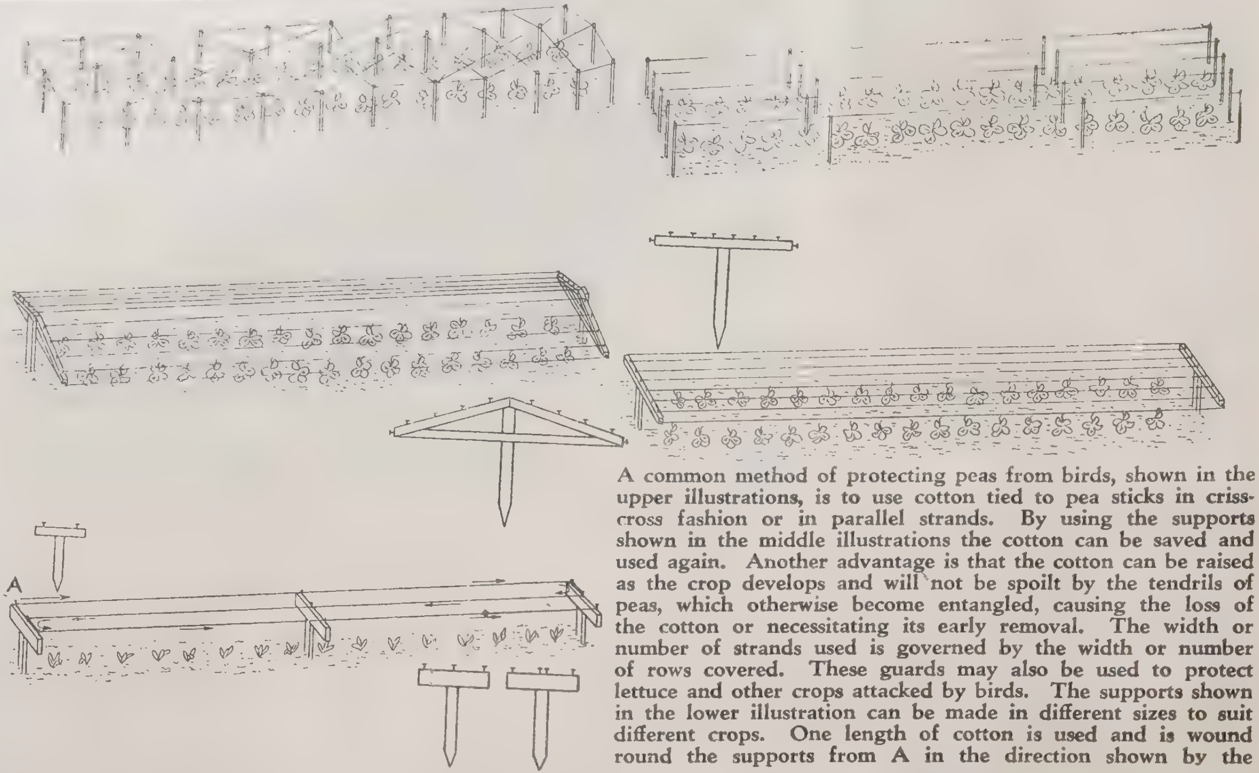
Greenfly is often troublesome on parsley, but is easily controlled by spraying with nicotine sulphate 1:800 (5 teaspoons of nicotine sulphate to 4 gallons of water plus 2oz. of soap dissolved first in a little hot water.)

Seed may take 28 days to germinate, but sometimes germinates quite promptly if it is first soaked or is sown in very moist soil. It should be sown ½in. deep and the plants thinned 8 to 12in. apart according to size. It is imperative that thinning should be done early and the plants given adequate spacing or they may go to seed prematurely.

Peas

Dwarf, quick-maturing varieties of peas can still be sown in northern districts where autumn conditions are sufficiently mild to enable the plants to mature pods and where there is sufficient moisture in the soil to facilitate prompt germination and immediate strong growth. Though peas are hardy, frosts of more than a few degrees in autumn will check growth, and when deciding whether or not to sow the incidence of frost in the district should be considered in relation to the normal maturity period of the variety chosen. Under favourable conditions some of the dwarf varieties mature in from about 58 to 70 days. Popular quick-maturing dwarf varieties are W. F. Massey, Little Marvel, William Hurst, and English Wonder. W. F. Massey is the most popular of the first early varieties, as it has a fairly-wide range of adaptability to soil and climate. It produces a fairly-good crop of good-quality pods, but requires a fertile, well-drained soil. The culture of peas was described in last month's "Journal."

METHODS OF PROTECTING PEAS FROM BIRDS



A common method of protecting peas from birds, shown in the upper illustrations, is to use cotton tied to pea sticks in criss-cross fashion or in parallel strands. By using the supports shown in the middle illustrations the cotton can be saved and used again. Another advantage is that the cotton can be raised as the crop develops and will not be spoilt by the tendrils of peas, which otherwise become entangled, causing the loss of the cotton or necessitating its early removal. The width or number of strands used is governed by the width or number of rows covered. These guards may also be used to protect lettuce and other crops attacked by birds. The supports shown in the lower illustration can be made in different sizes to suit different crops. One length of cotton is used and is wound round the supports from A in the direction shown by the arrows.

Potatoes

Where the tuber moth is troublesome precautions should be taken against it as advised in last month's "Journal." Potatoes that are still growing should be kept weed free and moulded so that exposed tubers do not become green and unpalatable. The ridges should be as sharp as possible so that if the tops are attacked by potato blight the spores will not be washed down where they will infect the tubers and cause them to rot.

Blight is not usually troublesome in the drier southern districts, but it may occur anywhere in New Zealand and usually appears about midsummer. Its attack is favoured by humid weather and the tops are killed very quickly in conditions that favour the disease. It can be first recognised by the irregular, dark-brown, water-soaked areas on stems and leaves. The leaves become limp and there may be mildew on the under-sides in damp weather. The stems blacken and decay. Tubers should not be lifted when there are blight spots on the leaves as they may become contaminated with the disease and later rot in storage. Unless the potatoes are required for immediate consumption, digging should not commence until about a fortnight after the haulm has completely died down.

Alternatively if it is desired to lift and store the tubers, the tops can be cut or pulled off by standing on the ridge with a foot on either side of the top to hold the tubers in the ground.

Preventive spraying is advisable in districts where rainfall is rather high and conditions humid. A Bordeaux spray or suitable Government certified substitute should be applied from the time the plants are about 5 to 6in. high and before they are earthed up and continued in susceptible districts at 2-weekly intervals until harvest. The intervals can be longer if the weather remains dry. The disease is spread by spores that are wind-borne, but it may also be carried on infected tubers, which should not be planted, though trials have shown that infection will not necessarily follow the planting of infected tubers. It is likely that some infection is present every year in most susceptible districts, but it develops only if conditions are favourable. Infection may be carried over in tubers that are stored, kept for seed, or are merely refuse. By keeping a close watch it is often possible to check an outbreak, as the disease usually appears first on a few widely-scattered plants. If this happens early in the season, the infected plants can be removed at once and the remainder kept sprayed.

There is some varietal susceptibility to potato blight. Some varieties are almost immune, though unfortunately most of them are of little productive value. Up-to-date is very susceptible; King Edward, Arran Chief, Inverness Favourite, and Jersey Bennes are susceptible, and Majestic is much less susceptible.

Salad Crops

Salads are most in demand in hot weather, and if conditions are not too dry, there should be some salad vegetables available in most home gardens in February. Tomatoes and cucumbers are regarded as main-crop vegetables and are ready for harvesting in most gardens, but successional sowings are necessary for radish, spring onions, lettuce, mustard, and cress. Chives are an excellent substitute for spring onions and should be grown in the garden of every household where the flavour of spring onions is appreciated. The leaves or "grass" are used as a mild substitute for onions in flavouring salads, soups, and omelets. Chives are easy to grow and do not require any particular soil, though they do especially well in a good, well-cultivated soil that suits onions. If the foliage is cut frequently, new tender "grass" develops continuously. Plants should be lifted, divided, and replanted in fresh ground in spring or autumn every 3 or 4 years.

Radishes are not easy to grow successfully in hot weather unless the soil is very fertile and there is adequate moisture. The roots should never be allowed to dry out, and in February shelter from the sun is usually advisable. It can be given by sowing in the shade of a taller crop such as celery or sweet corn. The top 6in. of soil for radishes should be finely cultivated and very rich in well-rotted organic matter. Seed should be sown ½in. deep in rows that need be only about 4 to 6in. apart. The soil should be gently firmed before sowing or the roots will not bulb properly.

Good-quality lettuce is an essential component of most salads, but, like radish, it is not easy to grow well unless conditions are favourable. It

[*Green and Hahn Ltd. photo.*

Radishes are not easy to grow where conditions are hot and very dry. The soil should be uniformly moist, rich in humus, and worked to a fine tilth.

requires a constant and fairly-high degree of soil moisture from seeding to harvest, as wide fluctuations are liable to cause the plant to run to seed prematurely or to cause the quality to be poor; plants may not heart well and are usually tough and bitter. The soil should never be wet for any length of time after rain or irrigation; it should drain quickly so that it is soon freely workable. On the other hand its moisture content should never become so low that more than the surface is dry. Such exacting conditions make lettuce production in hot, dry districts very difficult and the more adaptable varieties should be chosen where possible.

Varieties such as Imperial 847 and New York No. 12 have a wide range of adaptation and can be grown for a long period in most districts. Strains such as Webbs Wonderful, Neapolitan, and Success are, however, closely related and in general give good results. For those who are content with an open rather than a hearting type of lettuce the variety Bronze Beauty is excellent. It matures very quickly and has an excellent, rather nutty flavour. It is a vigorous grower and is resistant to hot conditions. The colour of the leaves is a ruddy bronze overlying a soft green.

Seed of lettuce should be sown thinly ¼in. deep in rows 12in. apart and the plants should later be thinned 10 to 12in. apart in the rows.

Silver Beet and Spinach Beet

There are now some very fine strains of silver beet (Swiss chard or sea kale beet) on the market and the large but tender and succulent midribs of some strains, if properly prepared for the table, are not inferior to sea kale in flavour. In New Zealand the plant is grown mainly for its green leaves, which are a rich source of vitamins. Under favourable conditions silver beet yields very heavily. It stands well, but is not as long standing as spinach beet, a closely-allied plant, the leaves of which are used after the manner of spinach. Spinach beet can, however, be harvested for very much longer than spinach and once established it is more tolerant of adverse conditions such as dryness and extreme temperature changes. It will, for instance, produce a continuous supply of leaves in hot, summer weather, when true spinach is difficult to grow.

Both silver beet and spinach beet are very useful, relatively quick-maturing vegetables which grow well even in the cool conditions of early spring or autumn. To maintain a succession seed should be sown outdoors in early spring as soon as the ground is in condition, though if it is sown in boxes under glass and the plants set out when large enough, earlier crops can usually be obtained. Later sowings are usually made where the crops are to stand and if soil conditions are sufficiently moist, thinnings can be transplanted.

The soil should be well drained, well cultivated, and enriched with well-rotted organic material such as stable or farmyard manure or compost or with blood and bone. Where mineral fertilisers are required (and on most soils results are better if organic manure is supplemented with artificial) a complete fertiliser high in nitrogen and phosphoric acid should be applied at the rate of 2 to 4oz. per square yard. It is important that the soil should contain sufficient lime, as beet is rather sensitive to soil acidity.

In most districts spring crops can be obtained from a February sowing, though, particularly in southern districts, the situation must be favourable and the soil in good condition so that the seed germinates promptly and the plants grow strongly during the remainder of the autumn. Later sowings are usually satisfactory in very mild districts. Seed should be sown in the open in rows 15in. apart and the young plants later thinned or planted out to about 8in. apart in the rows.

Varieties of Silver Beet or Swiss Chard

Fordhook Giant: This is a tall, sturdy variety with broad, heavily-crumpled (or savoyed), dark-green leaves and broad, thick, white stem and midribs.

Lucullus is an erect variety with stems broad, rounded, thick, pale green, and finely ribbed. The stem is bare for about 12in. of its 3ft. length. The leaves are fleshy and crumpled and yellowish to light green.

Large Ribbed Dark Green has smooth, slightly-crumpled, dark, glossy-green leaves. The stems and midribs are clean, white, broad, and comparatively thick. This variety has a very fine, distinct flavour.

White Silver is a medium-tall with broad, smooth, green leaves. The stems are fleshy, broad, and white with a greenish tinge.

Rhubarb chard is a recently-introduced variety with bright crimson-red stems and midribs. The leaves are crumpled and dark green, and have red veins. It is actually a Brazilian or Chilean beet.

Rainbow is a reputed cross between an improved Swiss chard and beet. It has large crumpled leaves and multi-coloured stems.

Spinach Beet

Perpetual Spinach or Common Green Spinach Beet has smooth green leaves with slender midribs of lighter green. Practically all varieties of spinach beet are similar in habit. They do not develop a main stem until they are ready to seed, but instead develop numerous leaves which may be picked over a long period.

Spring Cabbage

Except in a few northern districts where the winters are mild, the home gardener regards spring cabbage as cabbage of the smooth-leafed or pointed or oxheart variety, which is usually sown in autumn and over-wintered in the open for cutting in spring. In mild districts where the smooth-leafed, round varieties can be successfully over-wintered these cabbages may also be termed "spring" cabbage. Because the pointed or oxheart type of cabbage is hardy, relatively quick maturing, succeeds in a wide range of conditions, and is especially suited to autumn sowing in most parts of New Zealand, it is probably more popular in home gardens than any other cabbage except the savoy. Good varieties mature quite quickly under favourable cultural and climatic conditions, for though cabbage is primarily a cool-weather vegetable, growth is greatly accelerated by moderately-high temperatures if there is adequate moisture and the soil is rich in plant foods.

The average period of maturity is about 16 to 18 weeks, but the term average covers a wide variation in maturity time, and if temperatures are low and cultural conditions unfavourable, the plants may take up to about 7 months from seeding to maturity. Conversely where conditions suit them they may mature in considerably less than 16 weeks. It is this ability to succeed under a wide range of climatic and cultural conditions (though it is not possessed equally by all varieties) that makes the pointed type of cabbage so popular.

The first autumn sowing for overwintering in the open should be made in February, except in the milder northern districts, where a first sowing can if desired be made in March. Plants should be ready for setting out about 6 weeks after sowing.

Home gardeners often set plants out when they are very small. This practice is justified only if the garden is sheltered or conditions are very favourable. Plants should be sturdy and well developed and should be lifted with a fibrous tuft of soil and roots. Blind plants (those with no growing points) or very weak plants should be discarded, and if conditions are very hot and dry, about a third should be cut from the coarse, older leaf growth at the top of the plant. This reduces transpiration and in hot weather enables the plant to establish itself better. Plants with coarse, thick taproots usually develop better if about 1in. is cut from the root end.

Where considerable periods of low winter temperatures (40 degrees F. and down to freezing point) are experienced it is important that sowing is timed to produce a plant that is neither too large nor too small and this is the reason for a February sowing being preferred in most districts. Where the autumn is very mild, particularly if it is moist, the resultant soft growth and large plants are liable to damage if winter conditions are severe, and premature seed development may then occur in spring. Plants for setting out in late autumn in districts where winter conditions are severe should be sturdy and well developed with stems about 3/16in. but not larger than ¼in. thick (about the size of a lead pencil). Plants noticeably smaller may be killed if subjected to prolonged low temperatures and severe winter weather.

The seed-bed should be deeply dug and cultivated to a fine tilth. Soils lacking humus should be dressed with compost or well-rotted farmyard or stable manure. Manure should, however, be thoroughly incorporated, as germinating seed is likely to rot if it comes in contact with a considerable quantity. Seed should be sown ¼in. deep in rows about 12in. apart. It can be broadcast, but the plants are then more difficult to weed and a little harder to lift. Varieties such as Flower of Spring, Jersey Wakefield, and Early Offenham are among the quickest maturing; Jersey Queen and Enfield Market are classed as second early and normally mature about a fortnight later. Flower of Spring is the most suitable for a wide range of conditions and is very popular, particularly in southern districts.

[Green and Hahn Ltd. photo.

Silver beet or Swiss chard is occasionally known as sea kale beet, because the thick white midribs are not unlike sea kale. The plant is heavy yielding and the leaves are a rich source of vitamins.

Tomatoes

The spraying, pruning, and tying of tomatoes should be continued as required. Where growth is very heavy and the fruit is setting and developing well, yet ripening too slowly because it is shaded by foliage, it is advisable to cut back the covering foliage to about half its length with a sharp, clean knife. Spraying is thereby made easier and the likelihood of infection made less because of the improved air circulation and reduced humidity.

In northern and central districts where potato blight, looper caterpillars, and stem-borer caterpillars are troublesome the plants should be sprayed with Bordeaux or suitable Government certified fungicide to prevent potato blight and where there is no danger of arsenate of lead residue being eaten this poison can be combined with the fungicide at the rate of 1¼ to 2oz. to 4 gallons of spray to destroy the looper caterpillar and stem borer.

The stem-borer caterpillar is greyish green or pink and up to 1/3 to ½in. long with a dark head. Plants are usually attacked near ground level and the burrows of the caterpillar usually extend 6 to 8in. above the ground and about 1in. below. The moth is about ¼in. long with the wings closed; in this position it is wedge shaped and conspicuous. Its colour is greyish brown with a dark-brownish area on each side. The eggs are laid on the tomato leaves and the tiny newly-emerged caterpillars enter and tunnel them, working down through the petioles into the stem, though if the plants are young and the stems tender, they often attack the stems direct. If the stem-borer caterpillar is troublesome, plants should be burnt after the crop has been gathered, as pupation takes place in the stem.

Looper caterpillars are very active and may be up to 1¼in. to 1½in. long. They get their common name from their habit of arching their bodies and moving with a looping motion. They can be hand picked where the crop is too mature to risk spraying with arsenate of lead. Looper caterpillars are rather difficult to kill when well established, as they are active and move away from sprayed or dusted areas. Heavy dressings of derris or D.D.T. have given good results against the young loopers.

Winter Greens

Leeks can still be set out in most districts, but well-grown plants should be chosen. They should be set out as advised in last month's "Journal." Established leek plants, together with other late autumn or winter greens such as savoy cabbage, cauliflower, broccoli, brussels sprouts, and kale, should not be permitted to become dry. Adequate moisture is essential for quality and growth, and if the soil is poor or lacking in humus, all these subjects should be watered with liquid manure. Winter greens can still be set out in districts having a sufficiently-mild autumn, but good plants should be chosen and set out in favourable situations where the soil has been suitably cultivated and enriched.

BLOWFLY STRIKE IN SHEEP

By L. K. WHITTEN, Parasitologist,
Department of Agriculture Animal Research Station,
Wallaceville.

CONSIDERABLE economic loss results from the ravages of the sheep blowfly, particularly in the Merino and half-bred country of Marlborough. It is an important problem also in Hawke's Bay, Poverty Bay, North Auckland, and parts of Canterbury and Otago. Smaller numbers of strikes occur also in other sheep-raising districts of the Dominion. Not only is there loss of wool and loss of condition in struck sheep, but death of the animal will follow a severe strike which is not detected or treated early enough. The labour necessary for supervision and treatment of flocks contributes a great deal to the total cost to the farmer of this pest.

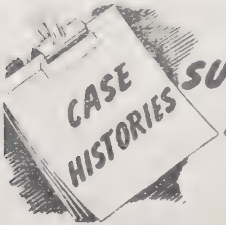
THE fly which is responsible for by far the most strikes over the greater part of New Zealand is the common brown blowfly, *Calliphora laemica*. The greenbottle, *Lucilia sericata*, is more important than *C. laemica* only in Canterbury and Otago. The bluebottles, *C. quadrimaculata* and *C. erythrocephala*, are of quite minor importance in connection with strike in sheep, though they will infest meat and carrion. The secondary fly, *Chrysomyia rufifacies*, the larva of which is known as the "hairy maggot," is of very minor importance in this country.

Life History

During its lifetime the adult female fly lays about 1000 eggs in batches of 50 to 100 on carrion or on a susceptible sheep. Some flies lay living maggots, others eggs or maggots, depending on the temperature and humidity. The eggs are small, yellowish-white, elongated bodies; within one or two days they hatch out and the young larvae or maggots begin to feed actively. They grow very quickly and after two moults reach their maximum size in from 2 days to 3 weeks. The maggots have a narrow head and a broad posterior end on which can be seen two dark spots, the breathing spores or spiracles which enable them to breathe while their heads are deeply buried feeding. After maximum growth is reached the maggots crawl away to seek a sheltered position or to burrow into the soil, where they become pupae encased in hard shells, within which the tissues of the maggots are changed into those of the adult flies.

Under suitable conditions of temperature and moisture the adults emerge from the soil, dry their wings, and fly away. The pupae may remain dormant over the winter or the adults may emerge in 1 to 2 weeks during the summer. The adult females require a protein meal before they begin laying eggs, usually three days after emergence. The life cycle from egg to egg takes about a month in the summer and the adult may live at least a month, during which time it can travel considerable distances of 10 miles or more.

Heading photograph by National Publicity Studios.



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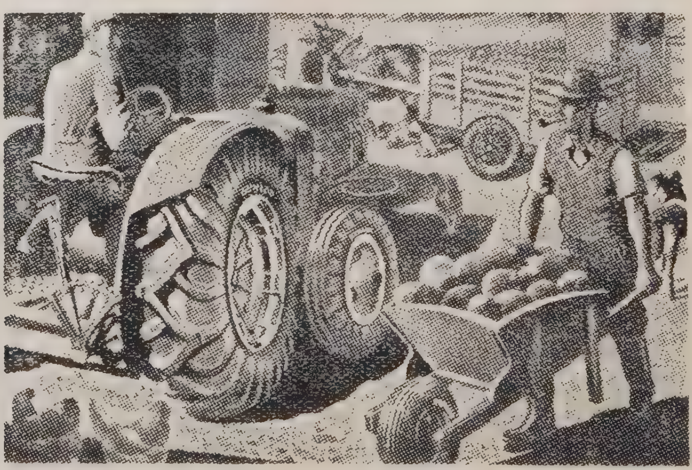

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BLOWFLY STRIKE

The types of strike common in New Zealand are crutch strike, tail strike, body strike, head strike in rams, and a small proportion of infestations of wounds, such as shear cuts, accidental wounds, marking wounds, facial eczema lesions, foot-rot lesions, and "bearings."

For fly strike to become established all four of the following conditions must be fulfilled:

1. There must be a sufficiently-dense population of flies which are ready to lay eggs.
2. The flies must be attracted to the sheep. The attraction usually results from wool which has remained moist either from soiling by urine or from heavy and prolonged rain, allowing putrefactive changes to take place and liberate odours attractive to the fly.
3. The flies must be stimulated to lay eggs after having been attracted to the sheep. (In some conditions flies may be attracted to sheep, but egg laying does not take place.)
4. There must be sufficient moisture present for the young maggots to survive until the strike becomes well established, after which there is adequate moisture in the form of exudates from the wound and secretions produced by the maggots themselves to maintain the strike.

Crutch or Breech Strike

Crutch strike is usually associated with soiling by urine and occasionally with soiling with faeces. Repeated soiling by a misdirected stream of urine from an irregular or distorted vulva, or by the presence of medial skin wrinkles on the breech, produces, after prolonged wetting of the skin with subsequent decomposition, inflammation and exudation, and the area affected is highly attractive to the fly.

Crutch strike in New Zealand tends to be a problem of hogget and 2-tooth ewes only. It is rare to find wethers struck, and crutch strike in ewes older than 2-tooths is also unusual.

Body Strike or Back Strike

Body strike may occur on any part of the body other than the crutch, but is most frequent on the back, in the region of the withers, or on the rump. Very often it is associated with "fleece rot," "water rot," or "dry yolk," as it is sometimes called.

Back strike is more important in New Zealand than it is in Australia. Compared with crutch strike the lesion is more extensive, the death-rate is higher, and its control more difficult. Most of the fly strike in older ewes is of this type. Back strike is very much more dependent on weather conditions than is crutch strike. It occurs mainly in the autumn—from February to May—and is most commonly observed after a period of heavy rain when the fleece remains moist and when high humidity prevents thorough drying. It is most likely to occur in autumn months with a rainfall of over 4in. It frequently occurs in the warm humid days following 5 or more consecutive days' rain. Rainfall and humidity are not in themselves sufficient to cause strike; in some districts, even though climatic conditions appear to be suitable, strike is unknown.

Strike usually ceases when the mean temperature drops below 50 degrees F.

In some districts body strike occurs annually, but in other parts it occurs only in an exceptional year. In some such years over 50 per cent. of a mob may be struck, though the normal incidence is much lower. It occurs most frequently in Merino and half-bred sheep, but Corriedales and Romneys and other breeds are also affected.

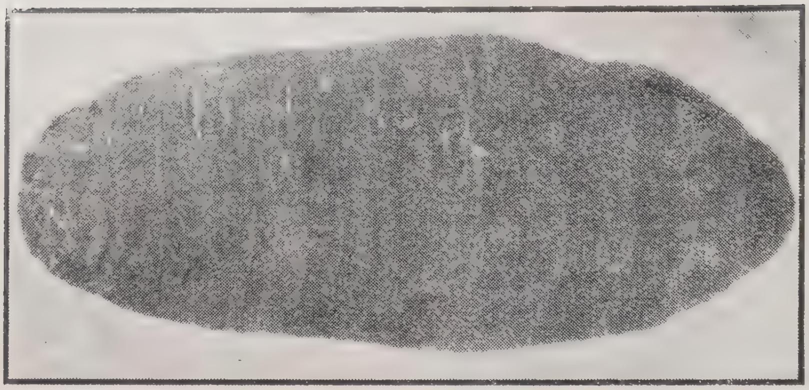
The presence of bush or scrub seems to favour blowfly strike and on some properties it is only in paddocks with considerable manuka or other second growth that blowfly strike occurs.

PREVENTION OF BLOWFLY STRIKE

As the wrinkliness of the breech of the Merino is an important factor in producing a susceptible state, the logical method of attack is to breed for plain-bodied sheep. This would be a long and costly process, and as most New Zealand Merinos have little development as compared with those of Australia, this aspect of the problem is less important here than it is in Australia.

Mules operation or the surgical removal of offending skin folds which would become soiled with urine has been used with considerable success in Australia. Areas of skin running down each side of the centre of the crutch are removed with shears, starting well up toward the side of the tail and finishing 2in. to 3in. above the inside of the hock. The sheep is held on a rail as for docking, but the hocks should be bent or the folds will be obliterated as the skin is stretched. The folds are raised with the fingers so that ½in. of skin is removed on each side of the base of the fold. If part of the bare skin is included in the fold, the latter should be rolled outward so that none of the bare skin is removed. It is a simple matter to remove the skin without damaging the deeper tissues, and if reasonable care is taken with cleanliness, the wounds produced heal completely within a

Above—Blowfly eggs. Below—Smooth blowfly maggot *(C. laemica).*



Blowfly pupa *(C. laemica).*

fortnight, leaving an otherwise susceptible sheep quite as immune as one naturally plain in the breech.

Australian work has shown that the Mules operation not only reduces the susceptibility of badly-wrinkled sheep, but if applied to plain-breeched sheep, it has the effect of reducing their susceptibility still further. It has been used successfully on Corriedale ewes.

The contraction of the scar tissue during healing results in a stretching of the bare area under the tail. A stretched bare area of this type is a man-made feature which cannot be obtained by selective breeding.

Mules operation has not yet been tested extensively in New Zealand, but in districts where breech strike forms a real problem to which a programme of crutching and/or jetting is not likely to prove a satisfactory solution, Mules operation in conjunction with the longer tail may give good results. This question, however, can be answered definitely only after large-scale field experiments have been carried out.

Australian workers have shown that the length at which the tail is docked has a considerable effect on the incidence of breech strike. Sheep with tails 4in. long suffer less than those with 2in. tails, while those with tails docked close to the buttocks suffer most. It appears that the longer tails press the breech wrinkles apart and so reduce the liability to wetting.

The tailing of lambs is an operation which deserves more attention and care than it usually receives. To produce a tail which renders a sheep relatively insusceptible to crutch strike throughout its life certain definite rules should be followed. The tail should be cut sufficiently long so that the tip reaches just below the tip of the vulva. A tail cut at this length, which is rather longer than usual, heals more quickly with less bleeding, less shock, less scab formation, and therefore less risk of strike immediately after marking. Gross infection which retards healing is more common in lambs docked short, and apparently this is related to the amount of muscle tissue where the cut is made.

It is important that none of the bare skin of the under surface of the tail should be removed, but it is also important that after healing has taken place no long wool should grow on the end of the tail, as this may become soiled with urine and allow tail strike to occur.

On healing, the tip of the tail should be covered by bare skin, and this can be encouraged by pressing the skin on the under-side of the tail forward toward the body, using the thumb of the left hand or the flat of the knife blade before the cut is made. When this is done the skin slightly overlaps the tail itself so that bare skin rather than wool-bearing skin grows over the tip of the tail stump.

It is immaterial whether the tail is docked through a joint or through a bone, as equally satisfactory results can be obtained in either case.

Recent observations by Australian workers indicate that longer tails tend to become more daggy than shorter ones. If this is also true under New Zealand conditions, it may be advisable to dock tails short in areas where crutch strike is rare, but where crutch strike is important the longer tail may be preferred in spite of the slightly greater amount of dagginess.

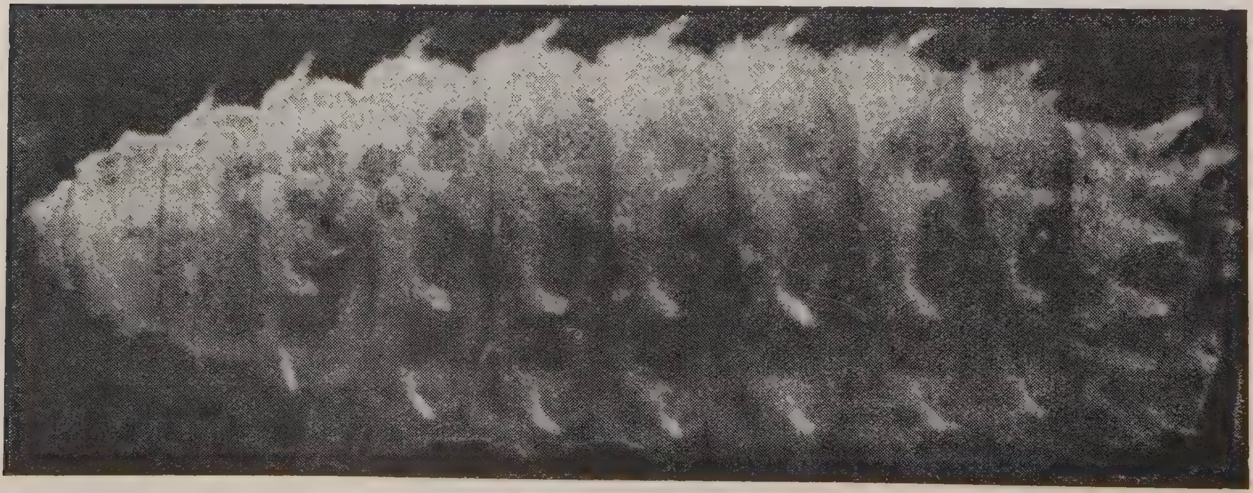
Shearing and Crutching

Shearing renders sheep insusceptible to fly strike for some considerable time. In Marlborough ewes in particular should be shorn before Christmas, if necessary leaving wethers and dry sheep till later. The shearing of lambs in some districts helps considerably in reducing losses from fly strike.

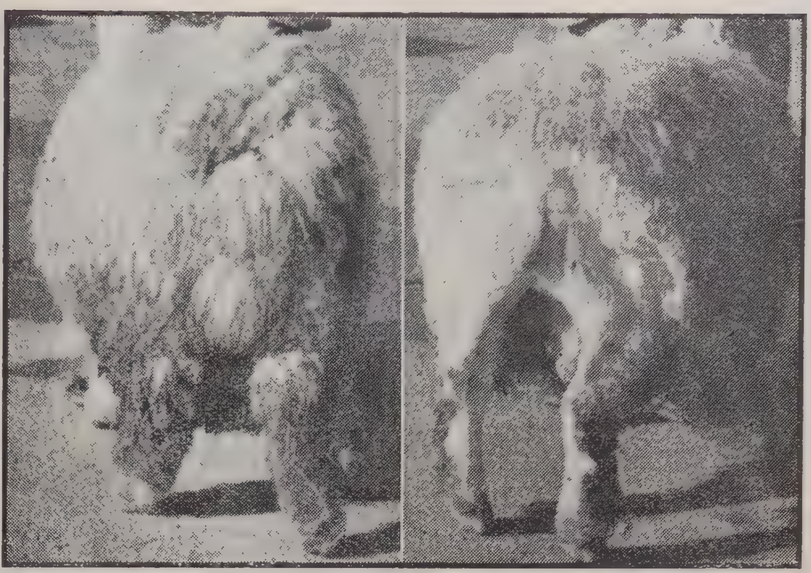
Crutching, the removal of wool from the breech, above the tail, and well down the back of the hind legs, is the best method of controlling crutch strike. Crutching of lambs in December or early January will give considerable protection when fly waves occur in late January and February. Crutching normally gives protection for about 6 weeks.

Jetting

Jetting is a practice which has been developed and used for some years in Australia with excellent results. Two



Hairy maggot *(Chrysomyia rufifacies).*



Correct crutching as shown at right reduces susceptibility to fly strike.

to three pints of a 1 per cent. suspension of calcium arsenite is forced into the wool of the crutch, at a pressure of 40 to 90lb. per sq. in., from a pump which is usually powered by a portable petrol engine. Fluid which drains away may be reused if a properly-constructed jetting race is available. Jetting will give protection for about a month and has the advantage that it can be applied at short notice, it requires less labour and expense than crutching, and it can be carried out by regular station hands. It can be applied at the beginning of a fly wave, in which case small strikes, less than 3in. in diameter, are jetted, but considerable risk attends the jetting of severe strikes. Intermediate strikes may be jetted at reduced pressure.

With the development of D.D.T. and "Gammexane" the possibility of their use in jetting mixtures has been considered. Preliminary trials have indicated that they both show considerable promise. Whereas calcium arsenite jetting required thorough penetration of the fleece, it appears that surface spraying may suffice with the newer materials. "Gammexane" appears to be more toxic to maggots but less persistent than D.D.T. D.D.T. also apparently prevents, to a large extent, the laying of eggs by the adult flies.

It is likely that mixtures of both materials may prove useful in the prevention of body strike in New Zealand, but very few trials have yet been carried out.

Dipping

Dipping as carried out for the destruction of keds and lice has little or no effect in blowfly prevention. Arsenical dipping fluids are claimed to be protective, but they are effective for only 2 or 3 weeks at the most. Moreover, dipping in a fouled bath will encourage fly strike.

In recent years the new insecticides D.D.T. and "Gammexane" have been incorporated in anti-blowfly dips and encouraging results have been obtained in field trials. The concentration of insecticide, however, is very much greater than that used for ked and lice control and therefore the cost is considerably higher. The amount of material used in dipping is large, and considerable economy could be effected by jetting or spraying only those parts of the animal likely to be struck, for example, the back, head, or crutch.

Materials available at the present time, however, cannot be expected to eliminate strike completely. They only minimise it. Constant vigilance is still necessary during the fly season.

Trapping

Trapping of blowflies has little effect on the incidence of fly strike in sheep unless the concentration of traps is so great that the procedure becomes uneconomic. Fly traps may be used to advantage close to dwellings, sheds, and slaughter-houses to reduce the fly population in the immediate vicinity.

The trap most suitable for this purpose is the Western Australian trap, which can be made easily from two kerosene tins and wire gauze. It consists of a tin the top and three sides of which have been largely replaced by gauze. The remaining side has a small trapdoor for the removal of dead flies. Into this tin is soldered a gauze pyramid with an opening at the top large enough to admit the blowfly. The trap is then mounted on a second tin which contains the bait, usually raw meat, liver, or offal with sufficient water to keep it moist. The addition of 3 per cent. sodium sulphide solution makes the bait more attractive and more lasting. On each side of the bait container a horizontal slit is cut 3 or 4in. long and ½in. high. The flap of the tin is not removed but is bent inward to make a slightly-inclined platform on which the flies can alight before entering the trap. After feeding on the bait the flies fail to return through the slits but are attracted upward by the light, and pass through the opening in the top of the pyramid into the trap above, from which they are unable to find their way out again. Dead flies are removed periodically and the bait renewed every 7 to 10 days.

Carcass Disposal

Carcasses of stock and game afford an excellent breeding place for large numbers of blowflies and should be destroyed as soon as possible after death. Burning is the best method of disposal and where firewood is scarce spraying with a third to half a gallon of crude oil or sump oil will aid in destroying a sheep carcass. Burial alone is of little real value in fly control, as flies are still able to emerge when buried several feet in loose soil. Burial after poisoning is quite satisfactory, and for this purpose arsenical dip, or borax mixed with equal parts of dry sand or soil, can be applied by means of a shaker. Spraying with a ½ per cent. solution of sodium arsenite is also effective. Poisoning as above, even without burial, is useful if the carcass is turned and both sides treated, paying particular attention to the mouth and tail regions where most of the eggs are laid. Poisoning without burial, if arsenic preparations are used, is attended by certain risks if such animals as dogs or pigs feed on the treated carrion.

Disposal of Infested Crutchings

The disposal of crutchings is more important than carcass disposal, because in the case of crutchings every single maggot may develop into a fly which becomes a potential danger to sheep, while in a carcass these must compete against other species which rarely cause fly strike. Crutchings should either be burned or poisoned with 1 per cent. arsenic. One simple method is to crutch the sheep on a square of strong canvas from which crutchings and maggots can be easily collected and burned or poisoned. In the paddock an effective maggot-killing dressing should be applied before shearing round a strike so that those maggots which do escape will die before pupation can occur.

TREATMENT OF BLOWFLY STRIKE

For treatment to be effective it is necessary to expose the whole of the affected area by shearing the wool so that a margin of at least 1in. of clean skin is left around the strike. The next step involves the removal and destruction of the maggots from the struck area. This is best effected by striking repeatedly close to the area with the flat of the shears and so jolting the maggots out of the strike, after a suitable dressing has been applied to kill the maggots before they pupate.

The perfect dressing which is non-irritant, promotes healing without excessive scab formation, is cheap and easy to apply, and which will kill the maggots and repel the adult flies has yet to be discovered, but the preparations mentioned hereafter have proved very valuable in the treatment of strike.

The application of dressings can be carried out effectively by the use of a brush which can be made by wiring horse hair to a suitable handle about 8in. long and cutting off the hairs at a length of about 4in. Treatment should be carried out as early as possible. During a fly wave close supervision of the flock is essential and, if possible, struck sheep should be drafted into a hospital paddock where, if necessary, they can be retreated without yarding the remainder of the flock.

On properties where occasional strikes occur unexpectedly and blowfly dressings are not available the following common materials may be used in emergency:—

5 per cent. bluestone solution or 5 per cent. zinc sulphate can be used. They do not penetrate very well, however, and the bluestone solution stains the wool badly.

4 per cent. coal tar disinfectant will kill the maggots quickly.

Dry boric (boracic) acid dusted on to the strike is a simple and effective treatment.

Stockholm tar should not be used. It is irritant, retards healing, and will not scour out of the wool.

Where blowfly strike is a problem and many strikes are treated a more elaborate dressing is required. The Council of Scientific and Industrial Research in Australia has developed a dressing known as B.K.B. which is made as follows:—

Correct docking reduces susceptibility to crutch strike.

Western Australian blowfly trap.

To make 2 gallons of B.K.B.

1. **Mix together powdered boric acid 3lb. and bentonite 9½oz.**
2. **Stir in Agral 2, 1½oz.**
3. **Of total quantity of soft water required (10 pints) add sufficient to the powder to make a smooth, thin paste.**
4. **Add 3½ pints of mixture of kerosene, 11 parts; lysol, 5 parts; and orthodichlorbenzene, 4 parts.**
5. **Stir thoroughly for several minutes until the oil is thoroughly incorporated in the paste.**
6. **Add the remainder of the water slowly with constant stirring.**

The bottle should be shaken before use and the dressing applied to saturate thoroughly the struck area.

New Insecticides

D.D.T. and "Gammexane" are materials which show promise as blowfly dressings. D.D.T. is toxic to first- and second-stage larvae and to adult flies, but has little or no effect on the third-stage maggot, which incidentally is the one most frequently seen in cases of fly strike on the farm.

This would indicate then that D.D.T. might not be satisfactory for the treatment of an established strike, but it might be valuable in preventing restrike. For this purpose, too, its apparent repellent action to female flies should be useful.

"Gammexane," on the other hand, is toxic to all stages of maggots and flies, but it is neither repellent nor attractive to adult flies. "Gammexane," though fairly persistent, is less so than D.D.T.

The new insecticides are still in the experimental stage, but it is likely that mixtures of the two may be very useful in treatment of fly strike.

Fly Repellants

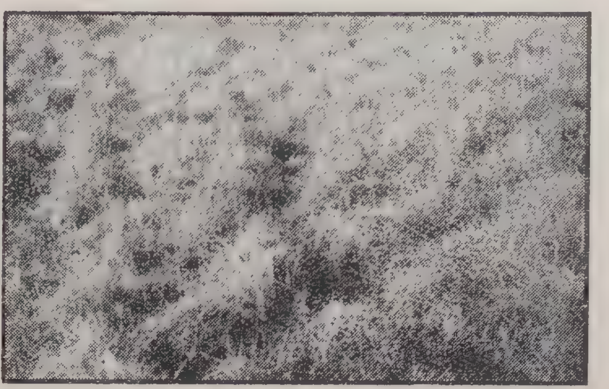
The idea that fly repellants may be useful has often been considered, but so far few substances have possessed this property. A large number of substances have been tested, but only two, oil of citronella and D.D.T., show promise of practical application. Where flies are troublesome at marking time a dressing containing citronella may be useful. It can be made as follows:—10 parts of soft soap are heated almost to boiling with 50 parts of water; 10 parts of oil of citronella are added slowly to the hot soap solution with constant stirring. (If added too quickly, frothing will occur.) A cover is placed over the vessel to prevent evaporation and warming is continued for several minutes until the preparation becomes uniformly transparent and syrupy. A further 30 parts of water are added and stirred in and the solution allowed to cool.

The value of D.D.T. as a lamb-marking dressing has yet to be determined.

CONTROL OF CALIFORNIAN THISTLE WITH COCKSFOOT

By M. M. MUSGRAVE, Department of Agriculture,
Christchurch.

CALIFORNIAN thistle *(Cirsium arvense)* has spread to such an extent in some parts of Canterbury that its control has become one of the major problems of farming. One of the most successful of the various methods of control that have been tried has been the growing of lucerne as a smother crop, but in this article is described a method of sowing cocksfoot *(Dactylis glomerata)* for a seed crop which has been successful in controlling the thistle on a farm where the paddocks were almost covered with it.



The area sown to cocksfoot in 1941 and free of Californian thistle.

WHERE lucerne is grown as a smother crop its frequent cutting in conjunction with its quick recovery has resulted in the eradication of Californian thistle from the paddock, and the method is successful on most types of soil in which lucerne thrives.

Success with the control of the thistle by the use of cocksfoot as a seed crop has been achieved on a farm on Coutts Island, an area of rich silt loam which lies between the south and main branches of the Waimakariri River north of Christchurch.

The farm, 176 acres, was taken over by its present owner in 1920 and run as a cropping and dairy farm until 1940. Forty-six cows were milked for town supply. During that period the farmer had used lucerne as a means of controlling the Californian thistle, and had up to 15 acres in the crop at one time. In 1940 the cows were sold because of the labour shortage and from then the farm was worked as a cropping and grazing unit.

The problem of the Californian thistle still remained, and though the lucerne would still have been a paying crop as hay for sale, the farmer decided he could not handle it and tried to find some other crop which would give the same results, but would not require the same amount of labour to harvest it.

Cocksfoot as a seed crop seemed to him to be the solution, because, as cocksfoot is cut for seed toward the end of December, he would be cutting the Californian thistle just at the flowering stage. Cut at this stage the thistle receives a severe check, and though it may come away, it does not reach the flowering stage again. The weakened plants are gradually smothered by the rank growth of the cocksfoot and after the first harvest only very weak plants are showing.

The areas sown down to cocksfoot had been in grass for 7 years and were almost covered in Californian thistle To avoid the land on which the cocksfoot was sown being unproductive for too long it was decided to sow the cocksfoot under a crop of barley. The first area of 23 acres was accordingly given a good preparation for barley and in the spring of 1940 it was drilled and harrowed. Certified Pedigree cocksfoot seed was then broadcast on the area and given a light harrowing and a rolling. The seed was sown at the rate of 10lb. per acre. No clover was sown with the cocksfoot, as the land is full of volunteer white clover which eventually filled in between the cocksfoot plants, but the sowing of white clover with the cocksfoot is usually considered preferable for best results.

The first area sown to cocksfoot. Dense growth of Californian thistle is apparent in the unsown area.

When the barley had been harvested the cocksfoot came away and the next season thickened up and gave a good coverage. No seed was taken that year. In the second season the first seed was harvested and yielded 124lb. of dressed seed per acre. By this time the thistle had practically disappeared and there were only a few scattered plants in the paddock. Three further areas were sown down in the same way, 7 acres in the spring of 1941, 3 acres in 1944, and 10 acres in 1945. Seed crops have been taken every year since 1942, except in the 1945-46 season, when a strong north-west wind threshed most of the seed on to the ground when the crop was ready to cut.

In addition to the seed crops taken from them the cocksfoot areas are used to finish fattening lambs that do not go away fat off their mothers. This is the only grazing the areas receive.

This farmer does not advocate cutting cocksfoot too early, as this tends to give a sample that is light in bushel weight. By cutting when the seed is ripe he gets a sample which averages over 20lb. to the bushel, but he probably loses considerable seed by shedding.

At present the first three areas sown down are still practically free from Californian thistle, but the area last sown has not had time to be greatly affected by the smothering effect of the cocksfoot. Next season, however, there should be a great reduction in the amount of thistle.

In the first area, which has been down for 8 years and is commencing to thin out, the thistle is beginning to creep in from the fence-lines, and it is here that the new hormone weedkillers may be of great benefit. Killing the thistle in the fences would prevent re-infestation of the paddocks when they are broken up again for cropping and the roots are spread by cultivation.

It is the aim of the farmer in using cocksfoot to control Californian thistle gradually to complete a circuit of those paddocks showing heavy infestation, the method being to sow to cocksfoot, ultimately to take a crop, and then to put the paddock back into grazing mixtures.

The first two areas sown down to cocksfoot could have been ploughed up after the third harvest, as the thistle was then under control, but as prices for cocksfoot seed were good, the areas were left down. The first area sown down was to be ploughed up last year.

From this farmer's experience it seems that on suitable soil the use of cocksfoot as a smother crop for Californian thistle is a good alternative to the use of lucerne.

CARE OF LIVESTOCK DURING FEBRUARY

Contributed by the Animal Research Division.

PREPARATIONS FOR TUPPING

If ewes have been held on short pasture since weaning, they should now be in good, hard condition. About 14 days before tupping they should be crutched and given the best pasture available. This will ensure that they are rising in condition at the time of mating, which is one of the most important factors in providing a good lambing percentage. Rams, too, should be crutched and flushed for about 3 weeks before tupping. They should be dipped before this flushing period, as dipping too close to tupping appears to reduce ram fertility.

* * *

COBALT DEFICIENCY

Bush sickness can be completely prevented by topdressing with 1cwt. of cobaltised superphosphate per acre and, in the North Island at least, this is best applied in the usual autumn topdressing. This rate supplies adequate cobalt, and if more superphosphate is used, the additional amount need not be cobaltised. For fuller details the Department's Bulletin No. 180 should be consulted.

* * *

COPPER DEFICIENCY

Scouring in cattle and staggering in lambs grazing on peat land can be prevented by topdressing the pastures in the autumn with 5lb. of bluestone per acre. Copperised superphosphate is now available, or the bluestone may be mixed with lime. For fuller particulars the Department's Bulletin No. 238 should be consulted.

* * *

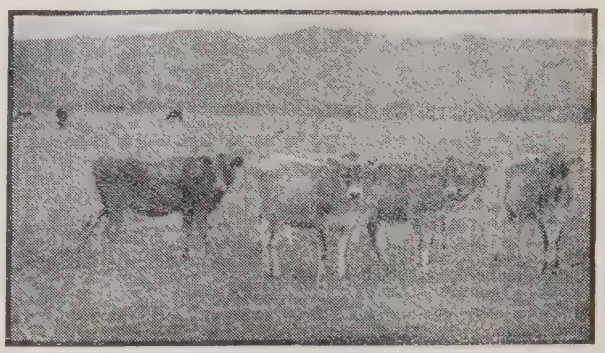
FACIAL ECZEMA

If warm rains fall in February after a spell of hot, dry weather, facial eczema is likely to occur in districts which are usually affected. Experience in 1948 conclusively showed that the disease can be prevented by shutting sheep up at the rate of at least 100 to the acre as soon as the rains fall and keeping them so confined until the weather becomes either hot and dry or much cooler and the pasture visibly hardens. If dry periods occur, plans should be made for action along these lines: Good hay at the rate of 2lb. per sheep per day will prevent loss of condition. If crops of rape, kale, turnips, chou moellier, or lucerne are available, they can safely be grazed during the dangerous period.

* * *

PULLORUM DISEASE IN POULTRY

Preparations should now be made for the autumn hatch by blood-testing the flock for pullorum disease and by cleaning and fumigating the incubators. A vacuum cleaner is ideal for cleaning, and advice on fumigation may be obtained from the local Poultry Instructor.



CARE OF CALVES

The autumn is a critical period for calves. Deaths during the winter can be eliminated by rotating the calves through the paddocks ahead of the cows at intervals of 3 or 4 days. If this is not being done, it should be commenced immediately. Calves treated in such a way will be up to 100lb. heavier as yearlings than those kept confined in a calf paddock. If calves are unthrifty and scouring, it may be necessary to give two or three doses of phenothiazine at 3-weekly intervals, but this is seldom necessary with calves which are rotationally grazed.

* * *

COWS RETURNING TO THE BULL

If a number of cows are returning to the bull 6 weeks after service, they are probably infected with trichomoniasis and a veterinarian should be consulted immediately.

* * *

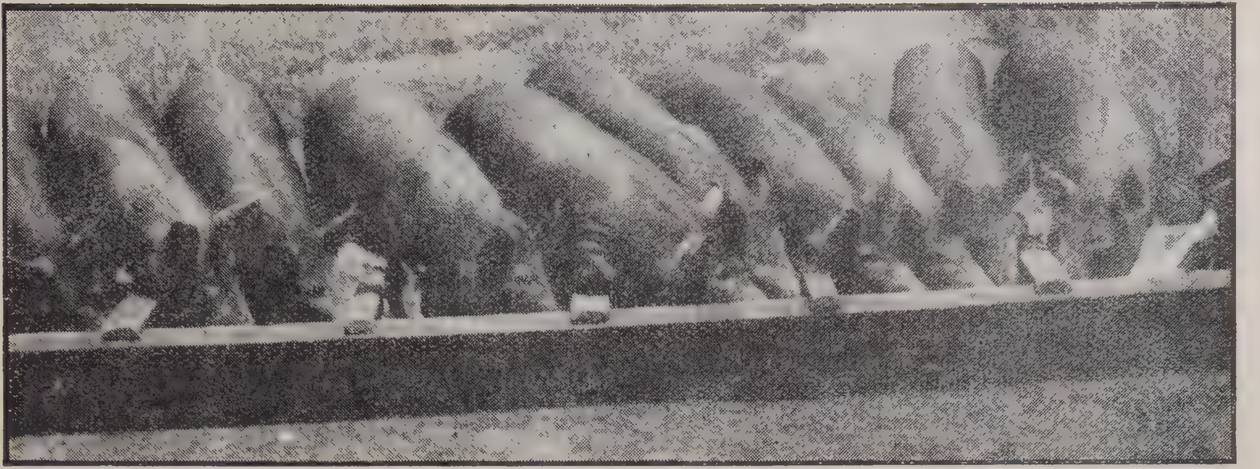
SOWS AND WEANERS

Sows which are to be remated should receive 6 gallons of milk per day for the first month after the litters are weaned. This will greatly facilitate getting them in pig. Weaners should be fed up to 1lb. of meal per day, as fast growth in the earlier stages means heavier pigs when milk supply fails. Pens showing deterioration of pasture should be harrowed and surface sown or ploughed in preparation for a crop.

* * *

SHEEP DIPPING

It is very important to follow the manufacturers' instructions exactly when dipping, and this is particularly necessary with "Gammexane" and derris dips. Investigations conducted last year showed that the lameness which followed the use of some of these dips was due to infection with a germ whose growth in the dip can be prevented by suitable antiseptics. All dips now being sold either contain sufficient antiseptics or have instructions on the label concerning their addition. If any dip bought last year is still on hand, the agents should be consulted before its use.



HEADING PHOTOGRAPH: The type of thrifty, rapid-growing pig which can be produced on whey with good management.

Whey Must be Fully Utilised as a Pig Food

WITH the decline in the quantity of all dairy by-products as the result of recent changes in manufacture in the industry, greater emphasis has been placed on the need to utilise all whey fully for pig feeding so that production can be maintained and the maximum effort made to export all possible pig meats to Britain. A survey of the amount of whey being used for pig food and the amounts going to waste throughout the season was made on a district pig council basis in the January, 1948, issue of the "Journal" and practical examples of the successful use of whey for pig food were dealt with in the February, 1948, issue. In this article H. M. Peirson, formerly Superintendent of the Pig Industry, Department of Agriculture, Wellington, outlines the methods of using whey as a pig food and describes the results of carefully-conducted field trials which have proved that whey feeding gives good cash returns.

BECAUSE of the urgent demand for pig meats both for local and export markets it is essential that all available feed supplies are utilised. Whey, the by-product of cheese factories, is a valuable pig feed and has great possibilities when used judiciously with other feeds. In estimating the value of whey as a pig feed consideration must be given to the necessity of building up the feed value to that of other high-quality feeds such as skim-milk and barley. Increasing the feed value means not only a reduction in the proportion of whey fed (farmers are familiar with the ballooned appearance of pigs fed on bulky feeds), but a gain in the efficiency of the whey. Consideration must also be given to the economics of doing this. The cost and quantity of the concentrates used are important factors in the successful use of whey.

Feed Values

On analysis whey contains about 6.5 per cent. of solids and average skim-milk about 8.7 per cent. Gallon for gallon whey therefore has about three-quarters of the feeding value of skim-milk. Of every 100 gallons of milk that go to a cheese factory there are only about 75 gallons of whey returned, and on storage there is loss of food value through conversion of sugar into acid. Consequently when allowance is made for the lower solid content and lower quantity available the whey from a herd of cows is about half as valuable as the skim-milk from the same herd. Most people know that, but do not know the reason for it. They argue reasonably that if whey is only half as good as milk, twice as much of it has to be given, but pigs overfed on whey do not thrive. The feeder is thus disappointed and decides that whey is not worth using.

Methods of Feeding Whey

Gallon for gallon fresh whey is three-quarters as good as milk, but as either may be used in a variety of ways ranging from good to bad, this comparison is true only when both are used to the best advantage. Whey is short of protein and generally it is necessary to use meat meal with it to get the best results. Three-quarters of a gallon of milk cannot be replaced with one gallon of whey alone, but when meat meal and whey are used together the return per gallon of whey after the meat meal used has been paid for is three-quarters of what could be obtained from milk.

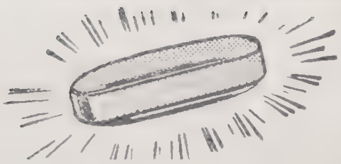
The methods of using whey differ for each type of pig and the different methods are set out below.

Sows

When there is plenty of grass in-pig sows can be maintained with as little as 2 gallons of whey and 1lb. of meal; in the absence of grass they may want 6 gallons of whey and 2lb. of meal. To build sows up before farrowing they should be given up to 10 gallons of whey and 2 to 3lb. of meal, mainly meat meal. After farrowing they should be fed 3lb. of meal and 10 to 20 gallons of whey, depending on the capacity of the sow and the size of the litter, the peak ration being reached when the litter is 7 to 10 days old. When the pigs are well started to feed out of the creep it will be found possible to reduce the concentrate to the sow, but in this the producer must be guided by the condition of the sow.

The Litter

Suckers will start to forage for themselves any time from 14 days of age, and their first attempts are to obtain food from the sow's trough. That is the time to establish the creep. Meat meal, barley, maize, or any feed that will encourage them will serve the purpose of starting them off. Meat meal rolled into pellets with a little tallow and scattered round the creep trough has been found excellent for getting young pigs started on the creep. These feeds should be fed dry for a start, as dry feed will encourage them to look for a drink, and whey should be available to them at the same time in a separate trough. At the commencement they will eat only a small amount of meal, perhaps 2 or 3oz. per pig, and about 1 pint of whey. This will gradually increase until at weaning the quantities will be ½ to ¾lb. of meal and up to 2 to 3 gallons of whey, according to the size of the weaners. At this stage most of the meal will have been added to the whey and the weaners are therefore used to the method to be followed after weaning.



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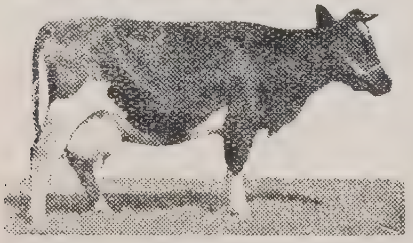

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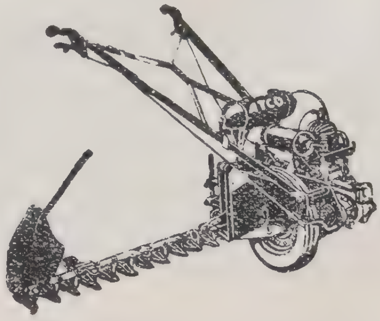

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USE OF WHEY AS PIG FOOD

Weaners and Stores

The usual practice followed when feeding weaners and stores is "to feed a little and often," which generally means four or five times daily. The meals should be mixed with the whey at the time of feeding, and not, as is sometimes done, put in with the bulk of the whey on its arrival at the farm from the factory. This is not a good practice and results in the first pens of pigs fed getting all whey and the last pens most of the meal. It also increases the possibility of fermentation, which reduces the feeding value of the whey. Pigs from 40 to 100lb. live weight should receive from 3 to 5 gallons of whey and ½ to 1lb. of meal. The first ½lb. of the meal in all cases should be meat meal.

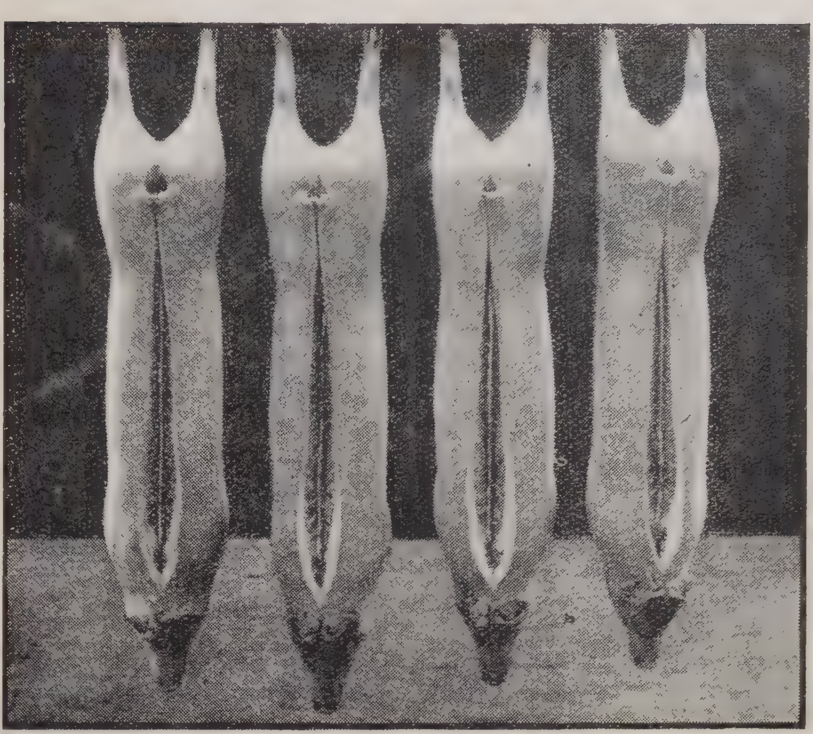
Porkers and Baconers

Between 100 and 200lb. live weight the ration will be increased to up to 8 gallons of whey and 1lb. of meal. Pigs of all ages on whey do better when allowed access to good grazing conditions. The grass provides the small amount of fibre necessary and the exercise aids digestion.

The following table is a simple guide to the quantities of whey and meal necessary for different types of pigs:—

	Whey	Meal
Sows, before farrowing ..	6 to 10 gallons	2 to 3lb.
Sows, after farrowing ..	10 to 20 gallons	3 to 4lb.
Litters, per pig	1 pint to 2 gallons	2 to 8oz.
Weaners and stores ..	2 to 5 gallons	½ to 1lb.
Porkers and baconers ..	5 to 8 gallons	½ to 1lb.

The feeder must exercise his judgment and be guided by the appearance and reaction of his pigs. Some pigs will utilise whey better than others.



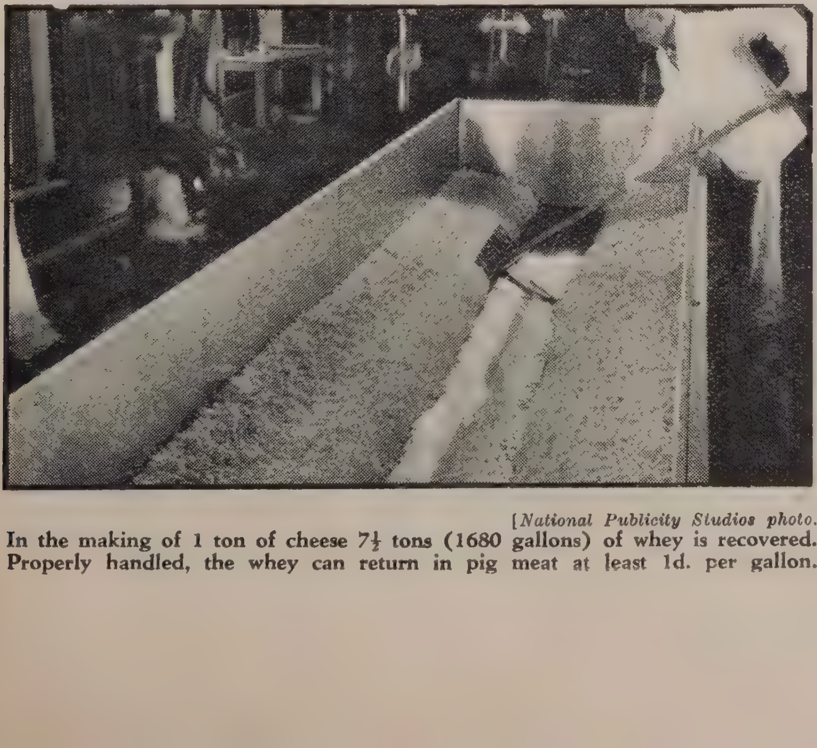
[*Sparrow Industrial Pictures Ltd. photo.*

This pen of whey-fed baconers with a total of 345 points out of 420 won the North Island baconer championship in the 1948 pig carcass competition conducted by W. and R. Fletcher (N.Z.) Ltd.

Care in Whey Feeding

Scours are more likely to be associated with whey feeding than with any other dairy by-product. Overfeeding should be avoided by feeding frequently at regular intervals, as this will prevent digestive troubles. Lack of suitable concentrates is also a factor, and that is why meat meal plays an important part in the use of whey.

Stale acid whey can also cause pigs to scour. The addition of a small handful of ground limestone to every 40 gallons will correct the acidity of whey and at the same time provide a very necessary mineral to the pigs. Too long a period between feeds will cause them to gorge and bring on scouring, giving them at the same time that unsightly pot-bellied appearance.



[*National Publicity Studios photo.*

In the making of 1 ton of cheese 7½ tons (1680 gallons) of whey is recovered. Properly handled, the whey can return in pig meat at least 1d. per gallon.

Ball-cock control of the whey to troughs, provided it is shut off daily for cleaning, has proved successful, especially where there are self-feeders, oaten or lucerne chaff being used as a spreader for the meal.

Wet and dirty sties can be remedied by the provision of dry bedding, care, and attention. Persistent scouring can be controlled by feeding grain meal dry, using a proprietary food or lime and cod-liver oil.

Pigs on whey should have access to grass where possible, especially older pigs. Grass provides useful roughage and minerals; it tends to limit the whey intake and so prevents indigestion associated with undue distension of the stomach, tends to keep the yard cleaner, and provides the useful exercise that maintains health. Grass cannot take the place of meals, but where possible it should be used with whey. The mineral needs of pigs depend on the kind and quality of feed used. Where pigs have access to good grazing little else than lime is needed.

The position is altered, of course, when pigs are confined to sties. The most important point in whey feeding is to feed little and often; three feeds a day would be sufficient where a good concentrate ration is fed, but four or five would be better.

The practice followed by many is to feed before milking, after milking, at midday, and before and after milking at night, five times daily, the concentrates being fed only twice, after milking in the morning and at the

USE OF WHEY AS PIG FOOD . . .

evening meal before milking. However, much depends on the amount of whey available and the quantity of meals used.

When whey is in short supply at a factory because one person is taking more than his share it is often diluted with water. Farmers should make sure that this does not happen at their factory, as diluted whey gives disappointing results.

Feeding Trials

The value of whey and the ways of using it with meals are shown by the following cases of feeding trials conducted on farms.

In the first trial there were 5 sows and 34 piglets. The 34 pigs were carried to a total dead weight of 2739lb., an average of 80lb. of carcass per pig, which was reached in 129 days or a little more than 4 months. The feed consumed by the sows and their litters during the trial was 15,300 gallons of whey, 1590lb. of meat meal, and 790lb. of barley. The cost of the feed consumed by the 5 sows was included in the feeding costs of the litters, so that the average amount of feed used per pig during the 17 weeks of the trial (birth to slaughter) amounted to 450 gallons of whey, 47lb. of meat meal, and 23lb. of barley.

The value of the meat produced at 9½d. per lb. was £108 10s. and the cost of the meals used (1590lb. meat meal and 790lb. barley) at £20 per ton overall amounted to £23 16s. The net return for whey fed was £84 14s., showing this much-despised by-product to be capable of giving a farm return of 1½d. per gallon.

In the autumn it is not uncommon to see slip and light store pigs sold in saleyards at sacrificial prices because of a shortage of whey, owners reasoning that meal is too dear at £20 a ton to feed to pigs and show a profit. However, the results that can be obtained when a little good concentrate is used are indicated in the following example:—

Of 48 pigs in 6 litters 24 were sold in March at 10 weeks of age for £1 each. The other 24 pigs were finished on whey and meat meal and sold in May at £3 each, giving a gross return of £72. The cost of the meal used (1280lb. for 7 weeks' feeding) at £20 per ton was £12 16s. The net return for the second group of pigs was therefore £59 4s. and with the value of the first group of 24 pigs deducted the value of the 5040 gallons of whey used was £35 4s. or 1½d. per gallon. The owner of these 6 litters intended to sell all his pigs in March because there was insufficient whey to feed them. It was pointed out to him that with the addition of meat meal the whey could be used profitably to finish at least 24 pigs. After 7 weeks' feeding the value of each pig was increased from £1 to £3 at a cost of 10s.

In 10 other trials carried out on whey the performances of 93 pigs were recorded. The average weight of the pigs when 8 weeks old was 40lb. After a period of 59 days' feeding the weights had increased by 56lb. per pig, a total increase in 59 days of 5208lb. During the period under trial 22,000 gallons of whey and 4026lb. of meat meal were fed.

The live weight produced was equivalent to 3484lb. of pig meat at 9½d. per lb., returning £138. The cost of the meal used (4026lb.) at £20 a ton was £40 5s. The value of the 22,000 gallons of whey fed during the trials was therefore £97 15s., which showed a net return of about 1d. per gallon.

Results with Sows and Litters

Whey has also given excellent results when used for litter production. Information collected in the course of litter recording during recent years has thrown considerable light on this aspect of pig production. It shows that of the 136 sows recorded 941 pigs were reared, an average of 7 pigs per litter, with an average weight at 8 weeks of 37lb. per pig. During the period between farrowing and weaning a sow and litter consumed 1000 gallons of whey and 200lb. of meal. With meal at £20 per ton the cost of rearing 7 pigs to the weaning stage was 40s. or about 5s. 9d. per pig for 8 weeks' feeding. These costs are actually very little in excess of those obtained with skim-milk. When the litter records of the 136 sows are related to the feed trials of the 93 pigs the results show that a 72lb. carcass of pork is produced for 386 gallons of whey and 74lb. of meal. On this basis 1lb. of pork is produced from 5½ gallons of whey and 1lb. of meal. With pork at 9½d. a lb. and meal at £20 per ton the return for the 5½ gallons of whey fed is 7d., or more than 1¼d. per gallon.

Importance of Good Grazing

Most people regard whey as unsuitable for pig feeding, judging its value by its watery appearance. However, it has at least two thirds the feeding value of skim-milk. Both these by-products, particularly whey, are improved by the addition of concentrates. It is no exaggeration to say that good results will be obtained only when some protein concentrate (meat meal) is used with it. In addition, good grazing assists materially in obtaining profitable results by reducing the amount of whey required in the production of pig meat. This in turn increases the number of pigs that can be carried on a given quantity of whey. Because the recent change-over to the drying of more and more dairy by-products will reduce the amount of total dairy by-products available for pig feeding, whey must be utilised to the full as a pig feed. Pigs can be fattened just as efficiently on whey properly supplemented with the right kind of meals as with skim-milk or buttermilk.

The right kind of meal does not necessarily mean the cheapest available. However, today meat meal, the main supplement with whey feeding, is cheaper than almost any other meal. The meal costs given in this article are somewhat liberal and the returns correspondingly conservative; meals have been costed at £20 per ton and returns for pig meat are shown at 9½d. per lb. The prices for meals last November were £22 per ton for barley meal, £19 per ton for pig meal, and £16 per long ton for meat meal. As whey is an embarrassment to dairy factories today, pig producers should make it a source of extra profit for themselves and extra meat for Britain.

◆

DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during November and for the 4 months ended November 30, 1948, with comparative figures for the same month and 4-monthly period of last year, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

	Tons			Tons	
Period	Creamery	Whey	Total	Percentage inc. or dec.	Total in store at end of mth.
November, 1948	21,800	370	22,170	+ 12.744	21,250
November, 1947	19,335	329	19,664	—	29,545
Increase or decrease	+ 2,465	+ 41	+ 2,506	—	— 8,295
For 4 mths. ended 30/11/48	60,046	1,006	61,052	+ 6.171	—
For 4 mths. ended 30/11/47	56,583	920	57,503	—	—
Increase or decrease	+ 3,463	+ 86	+ 3,549	—	—

CHEESE—

	Tons			Tons	
Period	White	Coloured	Total	Percentage inc. or dec.	Total in store at end of mth.
November, 1948	13,298	826	14,124	+ 16.534	21,398
November, 1947	12,120	—	12,120	—	16,852
Increase or decrease	+ 1,178	+ 826	+ 2,004	—	+ 4,546
For 4 mths. ended 30/11/48	31,599	998	32,597	+ 12.925	—
For 4 mths. ended 30/11/47	28,866	—	28,866	—	—
Increase or decrease	+ 2,733	+ 998	+ 3,731	—	—

If these figures are converted into butterfat equivalent, there is an increase of 7.437 per cent in butterfat graded for the 4 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which take place from time to time, they do not necessarily reflect actual trends of production on the farm.

VALUE OF SHORT-ROTATION RYEGRASS

SEASONAL NOTES contributed by the EXTENSION DIVISION

SINCE the production of the first commercial supplies of the new short-rotation ryegrass seed in the 1944-45 season considerable quantities have been available to New Zealand farmers, and the new strain has been tried out on farms throughout the country. At the same time the new type of ryegrass has been subjected to further field and plot trials designed to test the special features of the plant and to define its real place in the grassland farming of this country. From its testing by both farmers and research workers the grass has emerged as a very definite improvement on the false perennial hybrid types of ryegrass of short-rotation farming areas in the past and as a very satisfactory seed crop on arable farms.

SHORT-rotation ryegrass, which was bred by the Grasslands Division of the Department of Scientific and Industrial Research, is a hybrid obtained by the crossing of perennial ryegrass and Italian ryegrass. This hybrid was developed in the first place to provide a palatable, high-producing grass for those areas where a short-rotation farming system was practised.

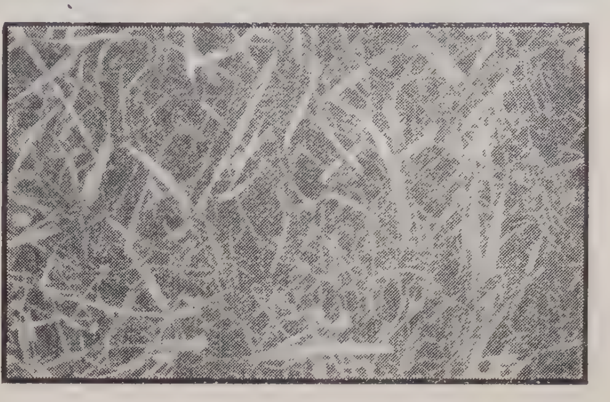
Short-rotation ryegrass has shown that it is well adapted to the short-rotation farming system as developed on medium to fertile arable land. It has the necessary vigour to give quick feed and to suppress weeds, and while it does not give quite as high production in the first winter and spring as Italian ryegrass, it continues on into the second and third season with a much lower summer death-rate of the plants and a much better winter and early spring feed production in subsequent years.

Although farmers on arable country in the South Island have found short-rotation ryegrass an attractive proposition for the production of seed, it has also demonstrated its capacity in early feed production. Providing the fertility of the soils is medium to good and drought conditions are not experienced, short-rotation ryegrass can be expected to last for several years under grazing.

Field trials and farmers' experience have shown, however, that short-rotation ryegrass has a very valuable place in permanent grassland farming also and can be used with advantage in dairy-farming districts and in fat lamb producing areas in both islands where new pastures are being established or old pastures are renovated by surface sowing.

Short-rotation ryegrass is much more palatable than perennial ryegrass and it can produce feed much earlier in the spring than perennial ryegrass. Moreover, because under suitable conditions it will last for several years in a mixed pasture, it will continue to contribute palatable and early feed much longer than will Italian ryegrass. For these reasons the use of varying quantities of short-rotation ryegrass in permanent pasture mixtures has been widely advocated, and experience in many dairying and fat lamb farming districts has shown that the new type of ryegrass can be expected to give good results and is a very valuable addition to seed mixtures.

Left—Perennial ryegrass. Right—Short-rotation ryegrass. The turf was photographed in July.



Autumn-sown mixture of short-rotation ryegrass and perennial ryegrass, showing the superiority of the short-rotation type in the production of spring growth.

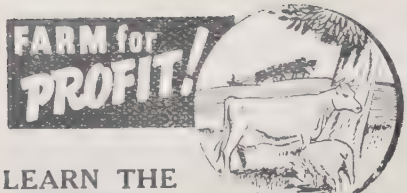
Sown in the early autumn as a substantial part of the permanent pasture mixture on either dairy farms or fat lamb farms, short-rotation ryegrass will contribute in two very valuable ways to the production from such pastures. Because of its relatively-high palatability and rapid establishment, it improves the palatability of any pasture of which it forms a part. Thus grazing control of the young pasture is easier and the smothering effect of the ryegrass in suppressing clover establishment can be prevented. Again, because of the very early growth of short-rotation ryegrass in the spring (in the North Island it can be expected to start vigorous growth as early as July and August), this grass will give a very welcome early bite not only in the first year of the pasture, but, because of its good persistence, in a number of subsequent years.

Certain features of this type of ryegrass must be stressed, however, if many of the disappointments which have been experienced in its use are to be avoided. This grass is a vigorous, leafy plant, and if it is to do well, fertile conditions such as those required for good perennial ryegrass growth are necessary. Again, if the grass is to survive the summer and persist, the land should not dry out excessively in the summer; nor will it persist through really droughty conditions unless it is allowed to reseed.

The high production period of short-rotation ryegrass is during spring and early summer, and it has a relatively-low production in autumn and early winter. If grazed too hard and continuously by sheep, especially in the spring, this grass is readily eaten out. It is much more suited to rotational grazing and will not stand the persistent hard grazing that perennial ryegrass does.

Permanent pasture mixtures containing from 10lb. to 20lb. of short-rotation ryegrass per acre have given very satisfactory results on both dairy and fat lamb farms, the higher rates of sowing being used where soil conditions are really good and a high feed production in early spring is required from the pastures.

Briefly, short-rotation ryegrass appears to be a very definite improvement on the false perennial hybrid types of ryegrass developed in the past on short-rotation farming areas, and it is also a very satisfactory proposition as a seed crop on arable farms. It can be used with advantage to replace Italian ryegrass and a substantial part of the perennial ryegrass in permanent pasture grass seeds mixtures on fat lamb and dairy farms where the fertility, particularly the nitrogen supply, is such that perennial ryegrass and white clover can be expected to thrive. Short-rotation ryegrass has no place on poor soils or light soils liable to severe drying out in summer.



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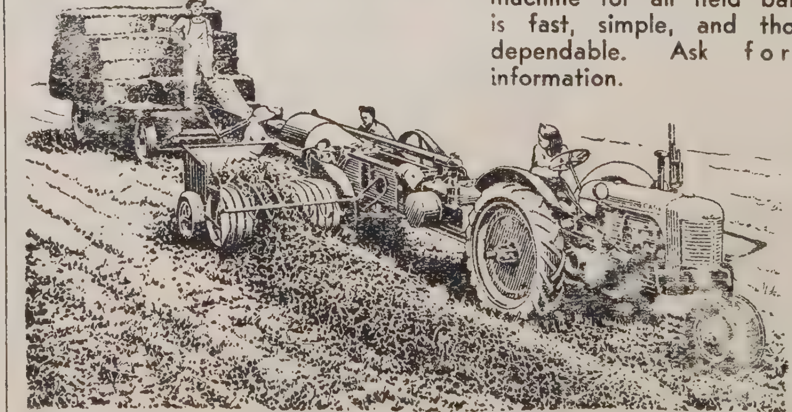

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D.N.O.C. Sprays Useful Weedicide in Onion Crops

SUMMARY OF RESULTS OF RECENT TRIALS CARRIED OUT IN CANTERBURY

THOUGH much work has yet to be done and many full-scale trials are to be laid down this season in an endeavour to gain further information, experiments in Canterbury on control of weeds in peas and onions by dinitro-orthocresylate (D.N.O.C.) sprays show that the sprays are a useful weedicide for onion crops. This article by J. F. Brown, formerly Assistant Fields Instructor, Department of Agriculture, Christchurch, summarises the results which have been obtained to date.

THE more common commercial preparations of D.N.O.C. at present on the market include Sinox, Dinoc, and Denoc. Sinox and Dinoc contain the sodium salt of D.N.O.C. in a 30 per cent. concentration.

More than 33 experiments were laid down in crops of onions, peas, and leeks, using sprays of various concentrations. On occasions the D.N.O.C. sprays were mixed with sulphate of ammonia, which acted as an activator and increased the effectiveness of the weedkiller.

No difficulty was experienced with the mixing of the sodium dinitro-orthocresylate, but great care was taken in each case to ensure a thorough mix when preparing the mixture before spraying.

The results of experiments laid down on light sandy loam, clay loam, and peat showed no variation, but definite variation in results occurred when trials were laid down on similar soil types under different weather conditions. The most satisfactory results were obtained when the temperature was over 70 degrees F. and there had been no rain either immediately before or after treatment. When temperatures were low or showery conditions prevailed at the time of spraying much poorer results were obtained.

Onions

It was usual when laying down a trial in onions to spray along the rows of onions after the farmer had cultivated between the rows. This meant that the spray could be applied at a rate much lighter than 1 gallon of the commercial liquid (diluted with 100 gallons of water) per acre and could be applied simply by walking along each row with a single-nozzle knapsack sprayer. The commercial liquid used in the trials contained 30 per cent. of the sodium salt of D.N.O.C.

When small plots were laid down to test the susceptibility of onions to D.N.O.C. before they reached the two-leaf stage all the onions were either killed or severely damaged by a concentration of 1 part of the commercial liquid in 100 parts of water, sprayed at the rate of 1 gallon per acre. A similar concentration also gave rather unsatisfactory results when used on onions just entering the two-leaf stage. In the district where the trials were carried out it was found that the majority of the onions growing at one time varied from plants which had reached the three-leaf stage to plants which had not reached the two-leaf stage. Where trials were laid down on areas that had just reached the three-leaf stage many of the plants survived, many were damaged severely, and the more weedy plants were killed. To avoid damaging the onions at all, it is therefore necessary to wait until the majority have reached the three-leaf stage.

Pre-emergence Spraying

With the exception of the more susceptible weeds, for example, wild turnip and shepherd's purse, the D.N.O.C. spray has been found effective only if applied when the weeds are very young. If it is necessary to wait until the onions have reached the three-leaf stage, the weeds present are frequently beyond the susceptible stage. This is a serious disadvantage to the use of D.N.O.C. sprays, but may be overcome to some extent by pre-emergence spraying—the spraying of a seed-bed before the crop appears above the ground. In the case of onions, which are usually sown ¾ to 1in. below the surface and take some time to appear, this method may be used quite effectively. A limited number of trials were laid down to find if pre-emergence spraying would control weed growth and varying results were obtained.

Where D.N.O.C. sprays were used control was achieved, but only a very few onions came away. The two experiments in which these materials were used as a pre-emergence spray for onions were laid down on sandy-loam-type soil, but whether the effect would be the same on soils with a higher humus content was not established. Soils with more humus have a greater number of bacteria, which it is understood will greatly assist in the destruction of D.N.O.C. compounds in the soil.

Where **power kerosene** was used as a pre-emergence treatment very satisfactory results were obtained; the onions came away strongly, no misses were evident, and it was not found necessary to control the weeds along the rows until the onions were well past the two-leaf stage.

Hormone weedicides were not used in these pre-emergence treatments on onions, but experiments using them will be laid down this season.

Concentrations

Provided the weather conditions are satisfactory at the time of spraying, a concentration of 1:100, at 1 gallon of the commercial liquid per acre, plus a little sulphate of ammonia (about 3lb. to 100 gallons of water) to act as an activator, appears most effective in Canterbury. Concentrations of 1:90 and 1:80, at a similar rate of application, were tried, but the results did not appear to be any better than the 1:100 mixture. Where a concentration of 1:80, plus sulphate of ammonia, was used many of the tips of the onion leaves were damaged, so it would appear that higher concentrations would be detrimental to the growth of onions.

Effect on Growth

It was noticed in all trials that there was a definite boosting effect on the onions. In every case treated onions were a much darker green than hand-weeded onions. This may have been due to the addition of nitrogen, as both the D.N.O.C. material itself and the sulphate of ammonia activator contain nitrogen.

Peas

In trials conducted on peas the whole area—not the rows only, as was the case with onions—was sprayed with a knapsack sprayer. Experiments showed it advisable to wait until the peas were more than 3in. high before applying the spray.

Concentration

As with onions, the commercial D.N.O.C. preparation mixed in the proportion of 1 : 100 parts of water, plus sulphate of ammonia (3lb. per 100 gallons of water), applied at the rate of 1 gallon of the commercial liquid per acre, was found to be the most desirable concentration. It appeared that nothing was gained by using concentrations of 1 : 90 and 1 : 80, and in the plots where sulphate of ammonia was included with the 1 : 80 mixture slight damage was done to the peas.

Californian Thistle in Peas

The most interesting result from experiments carried out on peas last season was in connection with crops infested with Californian thistle. With all the above-mentioned concentrations thistles were severely damaged, foliage died off, and main stems were blackened to ground level, except where the thistles were more than 2ft. high; here only the upper portion of the main stems was blackened. Where thistles were damaged by the spray peas were able to spread over a much greater area and there was a much greater yield than where the crop was competing with thistle growth. Thistles less than 6in. high at the time of spraying seldom recovered until the peas were well on in the flowering stage. This partial control of Californian thistle should be of some value in infested pea crops in the Canterbury district.

Effect on Growth

On peas, as with onions, D.N.O.C. sprays have a slight boosting effect, but it is not nearly as marked as with onions. The main difference between peas on treated and untreated areas was in the darker green colour of the foliage of the treated peas, but it is likely that lack of competition from weeds (where these had been killed by the spray) would have some effect on the peas. No yield comparisons were taken last season, but an effort will be made to do so during the coming season.

Effect on Susceptible Weeds

Within a few days of spraying with D.N.O.C. preparation the foliage of weeds wilts and becomes yellow over the whole of the portion of the plant above ground level. Provided the weather remains warm and dry the whole weed will be brittle and lying along the ground within 3 to 6 days. Older weeds are less susceptible, while young plants and different species vary greatly in their susceptibility. In experiments carried out in the Christchurch district under good weather conditions a number of the weeds most common in onion and pea crops were treated with D.N.O.C. materials and gave the following results:—

Susceptible in all Stages of Growth

Wild turnip (*Brassica campestris*).
Dead nettle (*Lamium purpureum*).
Shepherd's purse (*Capsella bursa-pastoris*).

Susceptible only when Young

Willow weed (*Epilobium* sp.).
Speedwell (*Veronica agrestis*).
Black nightshade (*Solanum nigrum*).
Spurrey (*Spergula arvensis*).

Susceptible only before Two-leaf Stage

Fat-hen (*Chenopodium album*).
White clover (*Trifolium repens*).

Shoots Killed or Damaged Severely, but Roots not Affected

Hoary cress (*Cardaria drada*).
Dock (*Rumex obtusifolius*).
Dandelion (*Taraxacum officinale*).
Catsear (*Hypochaeris radicata*).
Californian thistle (*Cirsium arvense*)—will grow again.
Convolvulus (*Calystegia sepium*)—will grow again.

Resistant

Fumitory (*Fumaria muralis*).
Stinging nettle (*Urtica urens*).
All grasses.

Comparison with Sulphuric Acid

Any simple sprayer can be used for the application of D.N.O.C. sprays and the commercial preparation of the sodium salt does not have to be stored in special containers and is not corrosive.

However, many farmers in New Zealand are continuing to use sulphuric acid for weed control in onions. (The methods employed by Manawatu onion growers were described by C. J. Hamblyn, Fields Superintendent, Department of Agriculture, Palmerston North, in the September, 1948, issue of the "Journal.")

Retirement of Director of Horticulture Division

AFTER 40 years' service in the Department of Agriculture, Mr. W. K. Dallas retired on November 30 from the position of Director of the Horticulture Division, which he had held for 10 years. He was succeeded by Mr. A. M. W. Greig, previously Executive Officer of the division.

MR. Dallas joined the Biology Division of the Department as a cadet in 1908. In 1912 he was transferred to Te Kauwhata Horticultural Station, where he studied fruit culture, viticulture, beekeeping, and wine making. Eighteen months later he obtained extended leave of absence to study fruit culture in Australia, Canada, and the United States of America, and he spent 2½ years overseas, gaining much valuable experience and knowledge. During that time he assisted the New Zealand Commissioner at the International Exposition at San Francisco and later was in charge of the Dominion's display at an exhibition in New York. On his return to New Zealand he enlisted in the Expeditionary Force and saw active service in France in the First World War.

After his discharge from the army in 1919 Mr. Dallas became Orchard Instructor, Christchurch, being transferred to Otago-Southland in 1924. Six years later he was seconded to the Plant Diseases Division, Department of Scientific and Industrial Research, Palmerston North, where he was responsible for horticultural experimental work in all the principal fruit-growing districts of the Dominion. He served in the head office of the Department of Agriculture for 3 years before becoming Director of the Horticulture Division in 1938. In recent years he visited Australia and Norfolk Island to investigate the importation of fruits and plants into New Zealand.

[*N. C. Wilkinson photo.*

Mr. Greig.

[*Crown Studios Ltd. photo.*

Mr. Dallas.

Mr. Dallas has taken an active interest in the Royal New Zealand Institute of Horticulture since its inception and holds the institute's diploma. For the past 10 years he has been a member of the Dominion executive and the examining board.

The New Director

Before joining the Department of Agriculture Mr. Greig had 8 years' experience of the growing of citrus and sub-tropical fruits at Kerikeri, Bay of Islands. On joining the Department's staff in 1937 he was appointed Orchard Instructor, Auckland, later transferred to Tauranga, and from 1939 to 1943 was Citriculturist attached to the Auckland office.

Mr. Greig was next transferred to Wellington for special work on vegetable production for war purposes. In the following year he was appointed advisory officer attached to the office of the Minister of Agriculture, and 4 years later he returned to the Horticulture Division as Executive Officer.

The new director is aged 42. He was educated at Wellington College and at Victoria and Auckland University Colleges. He holds the degree of Bachelor of Science and the National Diploma of Horticulture (New Zealand).

FOOT TROUBLES IN FARM ANIMALS

By I. G. WATT, Veterinarian, Department of Agriculture, Auckland.

WHEN the community depended on horses for transport, when the axiom "No foot, no horse" was understood by all horsemen, an intense study of the foot of the horse was made by the veterinary profession, which could treat the hundred and one troubles which originated in the most useful and most ill-treated portion of the animal. Breed societies in maintaining type and purity of the different breeds of horses stressed the importance of endeavouring to breed a sound hoof in their animals, and in the same way, to suit a particular locality, the Romney Marsh sheep was evolved as a pure breed with a hoof extremely resistant to wet conditions which would have rotted the feet of other breeds. The number of foot troubles affecting farm animals today suggests that there may be a tendency, now that the emphasis has shifted largely from farm horses, to breed animals solely with regard to qualities involving production of meat, wool, or milk. This article is an easily-followed, practical guide which should help farmers first to recognise the various foot ailments most commonly found in farm animals in New Zealand, secondly to apply the simplest and most effective methods of curing the troubles, and thirdly, wherever possible, to prevent occurrence of the diseases.

AS an introduction to the subject of foot trouble it would be very desirable to have an idea of the structure of an animal's foot. The horse's hoof offers the most straightforward example and can be compared later with the hoofs of other farm animals.

Structure of the Foot

Referring to the horse's hoof in terms of the structure of the human hand, the horse may be said to walk on the tip of the middle finger, with the fingernail modified to form the hoof. The second and fourth fingers are reduced to mere knobs in the horse's hoof.

This method of progression has evolved down the ages as the horse diverged further and further from its primitive five-toed ancestor *Eohippus*, a tiny forest dweller about the size of a fox terrier, which depended on leaves for food and on concealment for safety, up to the horse of modern times, the product of the open grasslands, with long legs giving added speed as a means of avoiding its carnivorous enemies.

In the cow the third and fourth fingers constitute the foot and the second and fifth fingers are rudimentary.

The horse's foot, consisting of the horny hoof and the structure inside it, is a box of horn within which is a highly-complex system of bones and joints, tendons, cartilage, ligaments, elastic tissue, blood vessels, and nerves.

The diagram on the next page shows the essential bones of the foot and their relationship with the lower part of the limb and the hoof. To these bones are attached tendons which extend the limb or draw it back, ligaments which help to support the weight of the animal, and an extraordinary elastic apparatus, the frog, which prevents jarring.

The foundation of the foot is the pedal bone or coffin bone, which is roughly the shape of the foot, and in which is inserted the lower end of the main tendons of the limb. On each of the outer wings of this crescent-shaped pedal bone is attached a plate of flexible cartilage called the lateral cartilage.

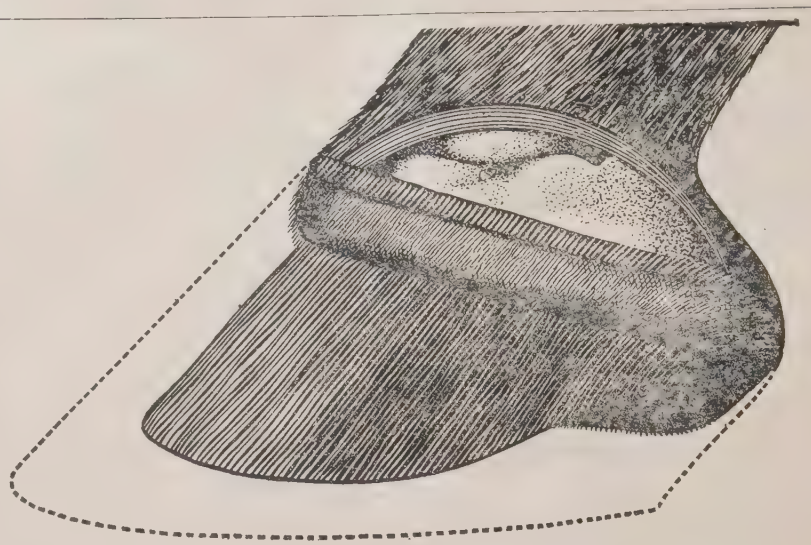
Between the wings of the pedal bone lies the elastic cushion which is overlaid by the horny frog. The frog, cushion, and lateral cartilages combine to absorb shock, which must be considerable when the 1000lb. or more of a fast-moving horse comes suddenly to bear on one limb.

The horny box called the hoof is attached to the pedal bone and the elastic cushion by an amazing membrane which has a very large blood supply. This accounts for the heat noticed when an injured or infected foot is felt with the hand.

Normally when any injury occurs to the soft tissue of the body, fluids collect at the site of injury, which swells. This fluid is part of the defence mechanism of the body against damage and is seen in the case of a sprained joint or broken limb. With an injured hoof, however, no swelling can occur, and consequently intense pain is experienced by the animal as the pressure increases inside the hoof. Anyone who has had an abscess under a fingernail can appreciate why a horse goes lame when there is infection inside a hoof.

Heading photograph by "Weekly News."

CONSTRUCTION OF THE FEET OF FARM ANIMALS



Foot of horse with the horny hoof removed to show the ridged membrane which attaches hoof to bone and looks like the under-side of a mushroom.

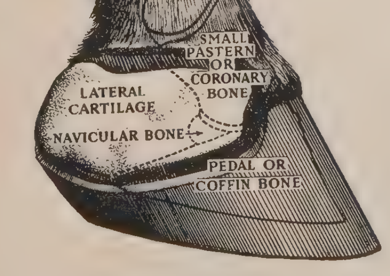
The membrane forms parallel vertical folds over all the wall surface, just like the under-side of a mushroom. These folds are called the sensitive laminae and fit into corresponding grooves in the inner surface of the horny wall. As there are about 700 of these laminae, they form a very strong attachment which suspends the pedal bone in the hoof as if the two were dovetailed.

The sensitive laminae are very easily inflamed if they become damaged by nails or cracks in the wall of the hoof, or if the horse founders. Foundering, which is generally associated with over-feeding or overwork, will also occur in fat ponies taking too little exercise. Founder causes inflammation of the laminae known as laminitis and consequent lameness. The hoof wall becomes irregular and ridged; very severe inflammation of the laminae can cause death.

The membrane covering the sole of the foot is provided with a different form of attachment to the horn, which is in this case secreted by the membrane. This membrane is covered with tiny tufts, or villi, and looks like velvet. These villi produce flakey horn in contrast to the hard, fibrous, tough horn of the wall of the hoof. The horn of the wall of the hoof grows **downward** from the coronary hand, or area at the junction of skin and horn, at the rate of ¼in. per month; the laminae of the wall normally do not form horn. Horn growth is most rapid in a healthy animal given plenty of exercise.

The white line at the junction of wall and sole marks the point of union of the flakey horn of the sole and that of the inner layers of the wall. In shoeing, nails are driven through the hoof just outside this line.

The horny frog is triangular and covers the sensitive elastic cushion. It corresponds to the pads of a dog or elephant. The presence of this compressible mass is essential to the well-being of the horse's hoof and it must never be cut away.



The horse's foot showing where the bones are situated.

How the Foot Operates

Although the hoof appears to be a hard box, it really expands as it comes to the ground and contracts when it is lifted. This movement is very important and maintains the circulation of the blood in the lower limbs as well as absorbing the shock of movement. When a horse has to stand still for any length of time, as on a ship, the legs tend to swell, because the pumping action of the hoofs is not available to maintain adequate circulation and return the blood through the veins. Further, when anything interferes with the elastic cushion—for example if the frog is cut away when the animal is shod—the normal expansion of the hoof is limited and eventually the heels contract and trouble ensues from that time.

A good hoof should have its walls unbroken, its outer surface smooth and even, and the angle at the toe not less than 50 degrees to the ground. The sole should be concave and the frog well developed. Dark hoofs are generally stronger than white.

As the wall of the hoof grows steadily, it must either be worn down or trimmed away at regular intervals. Overgrowth causes the hoof to become too sloping, when too much strain is thrown on the tendons.

Feet of other Animals

It may be said that each of the two main digits, or claws, of the ox corresponds to the one in the horse. The frog is not as well developed as in the horse, but there is an elastic cushion at the heel; the two vestigial accessory toes have short, conical capsules of horn.

In the pig there are four toes on each foot and in the dog five, one of which, the dew claw, does not function.

The special feature of the dog's foot is the presence of elastic pads which are intimately connected with the skin and also with the bones and tendons. These pads contain the only sweat glands present in the dog. The claws themselves are essentially similar in construction to the horse's hoof.

Diagnosis of Lameness

The foregoing outline of anatomy should enable a more accurate estimation of the nature and extent of injury to animals. It is, however, not always easy in cases of lameness to tell which limb is affected. If there is doubt, several hints which follow should be helpful.

If injury in the fore limbs is suspected, the animal should be trotted toward the observer, and if trouble is suspected in hind limbs, the animal should be trotted away from the observer. This should be done on a road or on hard ground.

If the trouble is in a fore limb, a horse will always **nod** his head when the **sound** limb comes to the ground and **raise** it when the lame foot takes the weight. A trotting horse with hind-limb lameness **raises** the hip when the **lame** limb bears the weight and **drops** it as the **sound** limb comes to the ground.

Frequent lifting of a limb is a sign of soreness in that limb. Shifting the weight from foot to foot may indicate lameness in both limbs.

In 90 per cent. of cases the cause of lameness in farm animals lies below the knee. The feet should always be examined first when attempting to diagnose lameness. The suspected hoof should be felt from the fetlock down and compared with the opposite one. Heat in a hoof is a sign of trouble.

Tapping a hoof with a hammer, giving smart taps but not heavy blows, may reveal a tender spot. A sound foot should be used as a contrast. When pain is caused the animal will try to draw the foot away and further investigation should be made of the area tapped.

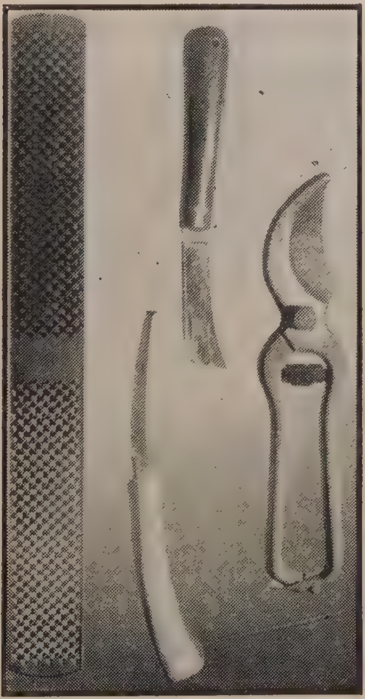
Pressing the coronet with the fingers will cause pain if there is inflammation there. Compression of the sole and wall between the jaws of a pair of farrier's pincers is another way of finding a sore place. Paring the horn of the sole at a place where inflammation is suspected will often reveal discoloured areas of horn and perhaps pus.

Shoeing Faults

Shoeing faults are not as important as they once were, but they are still a constant source of trouble. Faults include making the foot fit the shoe instead of the shoe the foot. This is common now that cold shoeing is so general. The main trouble noticed when the shoe is too small is the habit of rasping the wall of the hoof and so stumping up the toe, which removes the hard, outer, protecting layer of horn from the wall and opens the way for cracks to develop. Paring the sole or the frog is also unnecessary and is very harmful.

Shoeing Injuries

Injuries suffered at the time of shoeing should always be suspected if lameness develops within a few days of the horse's being shod. Nail bind, the first of these conditions, occurs when a nail in being driven passes so close to the sensitive laminae that it causes pressure and consequent lameness. With nail prick, however, the sensitive tissues are actually penetrated.



[Sparrow Industrial Pictures Ltd. photo.

Tools for combating foot troubles. From left: Rasp, searcher, foot-rot knife, and secateurs.

Both conditions may be caused in several ways; for example, by an incompetent farrier; because of thin-walled and broken feet; by an old nail which has been left in the hoof being forced by the new nail into sensitive tissues; by badly-made shoes, or by split nails.

Nail-bound animals usually leave the forge sound and go lame several days later. Diagnosis is made by removing the shoes and comparing the relative position of the nail holes. It should be ascertained that the lameness is not due to actual prick, which will be shown by dampness or discharge from the nail hole.

After the shoe has been removed the foot should be bathed in hot water and the animal rested until lameness disappears.

Nail prick is more serious. A nail driven during shoeing may go in at the wrong angle. If this is seen immediately and the nail is withdrawn at once, little trouble will result, though it is advisable to pour some disinfectant into the hole at the time. If the prick is not noticed and infection sets in, the trouble usually develops 3 days or so after shoeing. Signs of pain when pressure is applied and heat are symptoms. Remove the shoe and pare round the lower opening of any nail hole which appears to come out too high up the hoof. Hot foot baths using a disinfectant are helpful, but an opening must be made so that any pus can drain away. Nail pricks which are left unattended usually culminate in discharge of dirty pus at the coronet or heels, as the pus travels in the foot and takes the line of least resistance. In these cases an adequate opening should be made in the sole so that the pus can escape there.

Injuries to Sole and Frog

Puncture wound is a fairly common complaint and can be caused by the animal's stepping on sharp objects such as nails, sharp stones, or the upturned points of a harrow left lying in the paddock and overgrown with grass. The nail is usually found in the frog or at the junction of the frog and sole. Lameness is the first symptom.

Diagnosis is easy if the object can be seen, but it may have broken off and left only a dark patch at the surface. This is more visible after the sole and frog have been scraped with a hoof knife. If the nail has been in for several days, bacteria will almost certainly have entered the wound and infected the area. As tetanus bacilli are so commonly found in horse manure, it is advisable, if possible, to have an injection of anti-tetanus serum given by a veterinary surgeon.

There may be a dampness or a discharge of pus where the nail entered, but often the hole is closed and the pus under-runs the sole. At this stage there is severe inflammation and great pain. The after effects will depend on what parts of the underlying tissue have been penetrated.

The most dangerous region for a nail to enter is about the middle of the sole, because of the bones and joints above it. Further forward the pedal bone itself may be damaged. Nails picked up in the rear of the hoof rarely cause serious trouble, as they enter elastic tissue which is not readily infected.

The actual point of penetration may be difficult to find, but if the foot is well washed and the sole scraped, it is possible by pressure or tapping to find the sore place.

Drainage is all-important, as any pus present must be allowed to drain downward and not work its way upward to infect other parts of the hoof. All under-run horn should be cut away with a knife, preferably with a searcher, which is a fine hoof knife provided with a sharp, hooked end.

The opening which has to be cut in the sole to provide drainage when a nail has been recently picked up may be quite small, but if an extensive area of the sole has been under-run with pus, the amount of horn removed may be considerable. The dead horn should be cut away until sound horn is reached, leaving the underlying tissue exposed.

When drainage is established and the damaged area has been thoroughly washed with disinfectant dry powder dressings are the most effective way of encouraging healing. Sulphanilamide powder should be applied and covered with a pad of clean cotton-wool, which should be held in place with a bandage. Then the whole foot must be put into a leather boot, or if that is not possible, in a sack tied on so that it cannot fall off. Rest is naturally essential, and the horse must on no account be worked on hard surfaces until the horn has regrown over the whole of the area cut away.

Bruised sole is closely allied to corns and the two can be treated together. Bruising of the sole can be caused by stepping heavily on a stone, but it is generally due to badly-made and ill-fitting shoes in which stones become caught. Corns are usually due to pressure by the heels of the shoes over the seat of corn, the triangular area which lies between the wall and the bars. It is a condition generally confined to the fore feet and in New Zealand is due to the habit of leaving shoes on too long so that they are drawn forward by the growing wall until the heels press on the sole and not on the walls, where they should.

Corns and bruises are easily cured if they are treated early, but long-standing cases may become infected. Lameness, which is more noticeable on hard ground, is the main symptom. Heat may be felt when the foot is lifted, and pressure round the heels causes pain. If the sole is cut away at the area, discoloured horn or pus may be seen. When this is present adequate drainage is necessary, as suppurating corns or bruises can cause serious trouble if the pus goes upward. Treatment is to remove the cause; even removal of the shoes will often clear up the trouble. Hot foot baths and rest without shoes will clear up simple bruising or corns, but if pus is present, drainage must be provided as for puncture wounds.

FOOT TROUBLES IN FARM HORSES . . .

Ringbone and Sidebone

Ringbone, the common name for any bony enlargements in the pasterns, may be divided into several types. The only serious one, however, is articular ringbone, in which the bony overgrowth is close to, and involves, a joint. Here it will cause permanent lameness.

Any hard swelling of the region below the fetlocks should be regarded with suspicion, particularly if lameness is associated with it. No treatment is effective against ringbone, but most types are relatively harmless. A ringbone at a joint is hopeless.

Sidebone is the name given to the condition when the lateral cartilages (described previously) are converted into bone. It is usually confined to the fore limbs and is readily diagnosed by feel. The cartilages should be flexible, but when they are changed into bone they can be felt easily at each side of the foot. Sidebones are common in draught horses, but cause little trouble. There is no treatment. Both sidebone and ringbone are treated as unsoundness when a veterinary examination of a horse is made.

Quittor

Quittor is the name applied to a condition which occurs if a lateral cartilage becomes infected either through injury or by pus from a wound in the sole working its way upward. It requires veterinary attention and a serious operation to the hoof. Quittor should be suspected if there is a discharge of pus from the coronet in the region of the heels.

Sandcracks

Sandcracks are longitudinal cracks in the hoof which grow **downward** from the coronet and may extend as far as the bearing surface of the wall. Sandcracks, which are often associated with brittle hoofs, may cause lameness because of the movement of the horn wall about the crack. When sensitive tissue is pinched in the crack the horse goes lame. In bad cases infection may work under the edge of the crack. Treatment should aim at rendering the crack not continuous with the growing horn. Usually this is done by cutting a groove at right angles to the top of the crack, the full depth of the horn, the groove being started with a hot iron and finished with a searcher or fine hoof knife; alternatively V-shaped grooves may be cut to meet at the tip of the crack. A skilled farrier can drive fine nails horizontally across the crack and clinch them at both ends, thus stopping movement there.

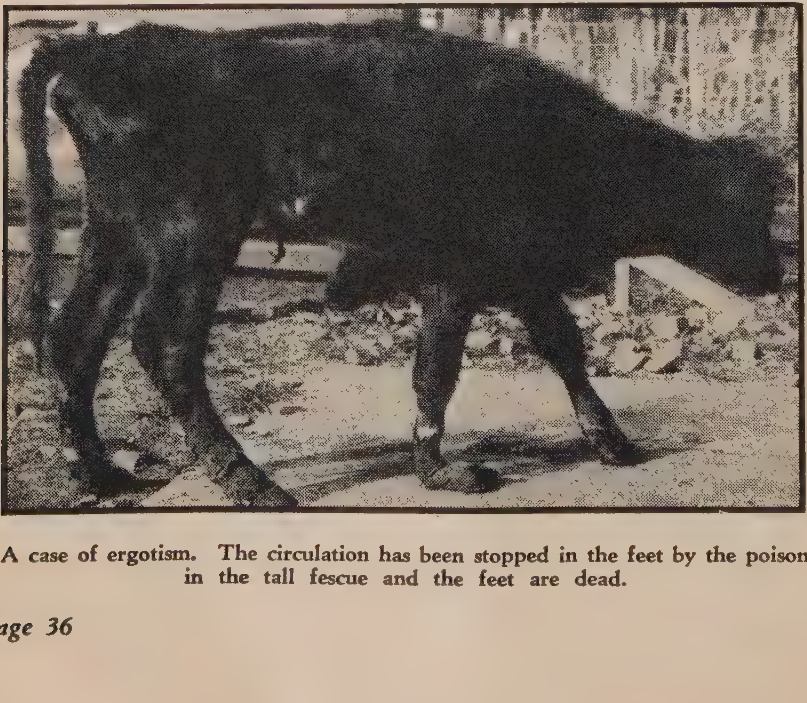
When a sandcracked hoof is shod the bearing surface must be cut away so that the wall at this part takes no weight. Clips on the shoe at each side of the crack are also helpful. Rest is imperative and stimulation of the coronet with a mild blister will help to increase horn growth.

Thrush

Thrush is a degeneration of the frog, which is indicated by the stench of the black, offensive pus produced. Thrush is more common in hind feet, especially in wet conditions, and particularly if the frog is cut away at shoeing. Lameness often follows thrush because of bruising of the damaged frog or cracks in the skin between the bulbs of the heels. The condition may be treated by trimming away the diseased horn and then applying powdered calomel two or three times a week or pouring a little formalin on to the area.

Canker

Canker is a serious disease in the horn of the sole and may follow thrush. It is very difficult to cure and results in soft, cheesy horn, which gives the diseased part the appearance of a fungus, and a fetid discharge. Calomel or salicylic acid applied to the sole after paring away the diseased horn is the best method of treatment, but it is a slow process.



A case of ergotism. The circulation has been stopped in the feet by the poison in the tall fescue and the feet are dead.

Greasy Heel

Greasy heel is an affection which occurs a little above the hoof, but is often allied to conditions producing thrush or canker. Greasy heel is a chronic, slow-developing disease affecting the skin of the back of the limbs, and is particularly common on the pasterns and fetlocks of heavy, hairy-legged horses. Symptoms are a horse's constantly scratching one or two legs on fences, etc., or stamping its feet. The hair on the affected limbs stands erect and the skin is at first red and painful, but later thickens, and finally becomes covered with fungus-like masses. Greasy heel also has an offensive smell.

In treating cases which have recently developed the legs should be bathed with warm water containing a mild disinfectant and then white lotion (1oz. of lead acetate, 6 drachms of zinc sulphate, and 1 pint of water) should be applied every two or three days until the legs are normal. The white lotion should be shaken well before using. For more advanced cases 1oz. of powdered bluestone should be added to the mixture.

A very effective treatment for older cases of greasy heel is to apply to the affected areas two or three times a week a well-shaken mixture of 1 pint of raw linseed oil and 1 fl. oz. of creosote.

If the "grapes" on the legs are very bad, surgical treatment will be needed, but for most cases the mixture of oil and creosote will keep greasy heel in check. It is a very difficult condition to cure completely.

Cracked Heels

Cracks in the back of the pastern are often caused by cold, wet conditions and excessive mud; the pain of cracked heels causes lameness. The area should be washed and dried thoroughly and then an antiseptic ointment applied, such as salicylic acid 5 per cent. in petroleum jelly or the following: Lead acetate, 4 drachms; salicylic acid, 4 drachms; carbolic acid, 2 drachms, and petroleum jelly, 8oz.

Laminitis

Laminitis, which was mentioned during the general discussion on the structure of the horse's hoof, is the name given to an inflammation of the membrane of the hoof. The usual form of the disease is fairly acute and there may be several causes. Some horses are more liable to attacks than others and over-fat horses or ponies taking too little exercise are prone to laminitis, particularly if they are given fast work or too long a journey in hot weather.

Over-feeding, especially with foods to which they are not accustomed, is a common direct cause of laminitis; for example, gorging on wheat or oats if a horse accidentally has access to a bag. Cases of laminitis frequently follow severe attacks of colic. Occasionally it is found in mares as an after effect of metritis or infection of the uterus.

Symptoms of the disease are pain and a high temperature. Great lameness is apparent; in fact the animal is afraid to move. If all four feet are affected severely, chances of recovery are not bright.

Great heat is noticed when the feet are felt and any tapping on the hoof causes it to be drawn quickly away. Symptoms often subside after a week and the horse recovers, but if much fluid collects under the horn of the hoof, great pain is caused and the animal may die.

Treatment consists in reducing the temperature by giving a drachm of aspirin every 4 hours and standing the animal in a creek or pool of cold water. If this is not possible, standing the horse in a heap of wet sawdust is helpful, but the sawdust must be kept very wet.

Exercise should also be given on soft ground; it is especially useful at an early stage of the attack. Half an hour's exercise is sufficient.

The horse should be given plenty of water and allowed to eat green grass. Bran mashes are helpful to keep the bowels free also.

Sometimes so-called chronic cases of laminitis are found, either after an acute attack or arising from some wrong treatment of the animal. Here the hoof becomes ridged and misshapen and the sole flattens or bulges downward.

Treatment, apart from shoeing with a special type of shoe, is not of much use, and a horse with chronic laminitis is fitted only for slow work on soft ground.

There are many other conditions affecting horse's hoofs, but the diseases described are the most common and can generally be cured by treatment on the farm.

CATTLE

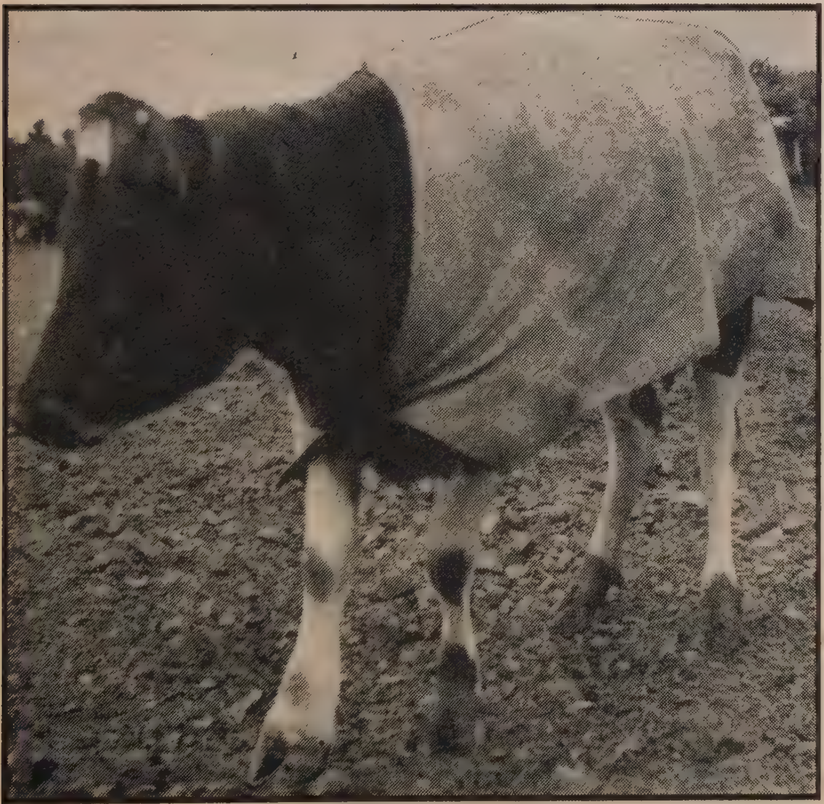
There are only three conditions affecting the feet of cattle to any extent in New Zealand, namely foot-rot (foot abscesses or foul in the foot), scald, and overgrown feet. Ergotism or loss of some or all of the feet after eating tall fescue is common in some areas, but is not a specific disease of the feet. It results from a stoppage of the circulation in the lower limbs due to an alkaloid or poison in the plant, with consequent death of the feet.

Scald

Scald is quite common and relatively mild. It does not generally produce lameness, but is probably the forerunner of the more serious foot abscess. The cleft of the hoof, known as the interdigital space, is somewhat reddened and inflamed, probably because of irritation with mud, metal, or other rough objects.

Early treatment of any feet in which abnormality is noticed is essential to prevent more serious trouble. Any mud should be washed off and a solution of strong bluestone applied with a soft paintbrush. This solution should be kept on a shelf in the shed in a glass jar and used as required. A 10 per cent. solution (2oz. of bluestone dissolved in 1 pint of boiling water) is concentrated enough, but a stronger solution can be used without risk. Butter of antimony should not be used, as it is too irritant and painful.

Concrete tracks are ideal and are the best method of avoiding unnecessary damage to hoofs by rough metal.



The swollen right fore foot and "tucked up" appearance of a bad case of foot-rot or foul in the foot. Foot-rot in cattle often follows damage to the hoof by rough metal or scoria.

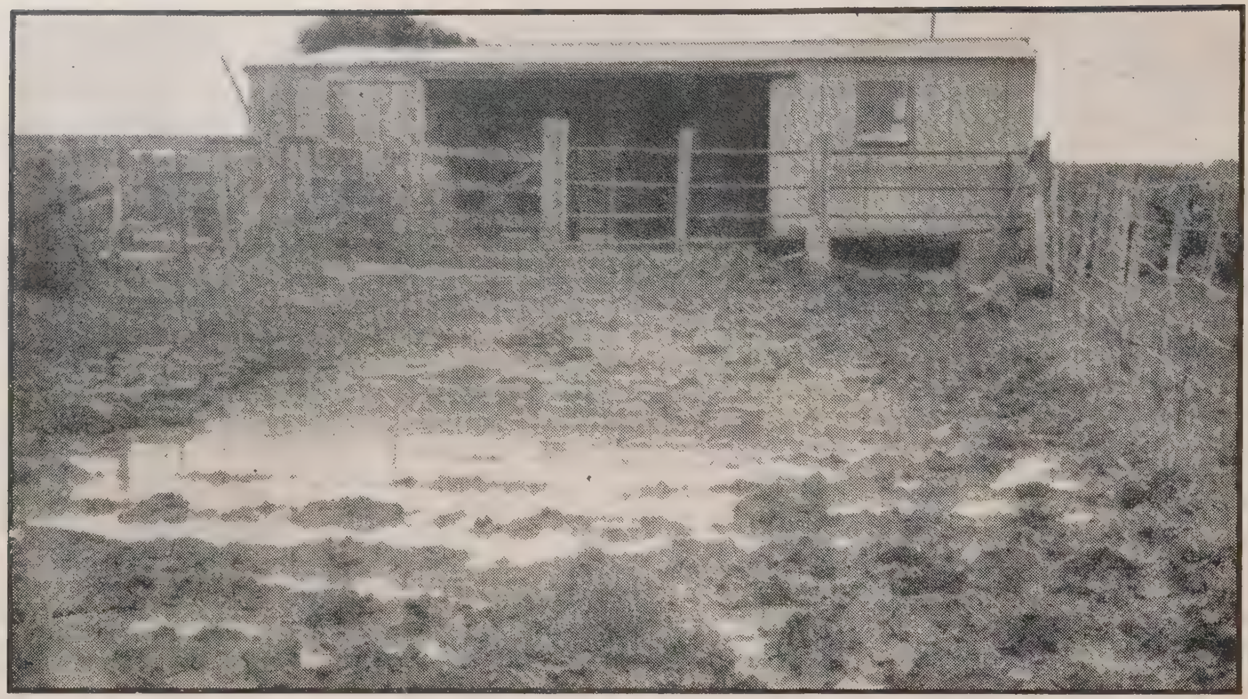
Foot Abscess (Foul in the Foot)

When bacteria entering the hoof through an injury result in a hot, swollen foot an abscess eventually develops and bursts. The abscess may be found in the cleft of the foot or pus may break out round the coronet of one or both of the claws. Lameness is very marked at this stage; the animal is obviously "off colour" and the milk yield drops.

The modern method of treatment, which is not very expensive and produces spectacular results and rapid recoveries in many cases, is the injection by a veterinarian of a soluble sulpha compound into the veins.

Bathing and poulticing do not seem to have very beneficial results, though they may relieve pain. In some cases when the animal is not treated the condition will clear up after the abscess has burst, but in others the joint may become infected and the animal may die or become permanently crippled. If valuable animals are affected, amputation of one claw by a veterinary surgeon may assist healing, but wherever possible the injection method is preferable, as after it the animals usually resume normal milk production in a very short time, especially if they are treated early.

Apart from treatment, prevention of foot-rot should be the aim, especially if a farm has a history of foot troubles.



Potentialities of foot-rot infection lurk in this mixture of mud and scoria.

The organism responsible for the trouble is *Fusiformis necrophorus*, which is common in many soils and is difficult to eradicate. It causes death of tissues with formation of yellowish pus. Under normal circumstances it does not cause trouble, as it needs a means of entry into a foot through injury or other cause before it can set up an abscess.

The primary cause of foot-rot in cattle is injury to the foot, particularly just above the junction of horn and skin in the cleft of the hoof. Scoria, especially when it is tipped into muddy crossings or gateways, is a most likely cause of foot injury, as it forms a powerful rasp which opens the way for the invading bacteria. Almost as bad potential causes of foot injuries are manuka fascines with sharp-cut ends, sharp metal in gateways, rusty barbed wire left lying about in mud, and rough bridges with ends of wires or nails projecting. In summer hard-baked mud in ridges or holes will produce sufficient damage to open the way for infection.

If foot-rot is particularly bad on a farm, new gateways should be arranged and old ones filled in with large metal covered with a thick binding layer of sawdust put down in dry weather. Concrete tracks are, of course, ideal, but cement shortages make their provision difficult at present. Double gateways that can be used alternately also help in preventing damage to the feet, as with their use there is less deterioration of underfoot conditions than takes place with constant use of one gateway.

The slightest sign of lameness or evidence of damage to a foot should be a signal for use of the bluestone solution. Violent friction with a rope between the toes is both useless and cruel. The old idea that foot-rot in cattle, like boils in humans, was the result of bad blood or germs in the blood making their way out through the skin is wrong. Foot-rot, like boils, is due to organisms which gain entry to the tissues through damage to the skin. If that damage is prevented, foot-rot will not occur.

Overgrown Hoofs

The toes of cattle whose hoofs are overgrown become too long—far too long in some cases—and the claws may even overlap. Lameness may be caused by the deformity preventing equal distribution of weight on the foot and causing overstretching of ligaments and tendons.

It is essential that a balance between growth of the hoof and wearing down of the horn of all animals should be maintained. The feet of cattle used as draught animals may be shod, as with horses, to stop abnormal wear, but on many New Zealand farms there is little or no wear of animals' hoofs and they become overgrown. The excess horn should be removed with a fine saw or hoof cutters.

SHEEP

Foot-rot

Foot-rot is one of the commonest complaints affecting sheep in New Zealand. Merino and halfbred sheep are very susceptible to it, and though Romney sheep are considered to be more resistant to foot-rot than the other breeds, under New Zealand conditions of pasture growth all breeds are affected.

In the light of modern knowledge, based on the excellent work of Dr. Beveridge in Australia, foot-rot has no need to be as prevalent as it is. Eradication of the disease from farms, with subsequent great saving in time and money to farmers, will be discussed later in this article.

The two main types of foot-rot in New Zealand are:—

(a) **Contagious foot-rot,** the type generally found on affected farms throughout both islands, which often affects up to 90 per cent. of a flock.

(b) **Foot abscess,** which is not usually considered contagious and which corresponds in cause and appearance to foul in the foot of cattle. It rarely affects more than 10 per cent. of a flock.

Contagious foot-rot or true foot-rot of sheep is caused by a combination of two organisms, *Fusiformis nodosus*, the primary cause, and *Spirochaeta penortha*, which assists. Neither of these organisms can exist longer than about 2 weeks on pasture or soil; even in mud they die rapidly. They are true parasites and are found only in affected feet, away from air, which destroys them readily. Their destruction when exposed to the air is a most important point when methods of control are considered.

Spread of the disease is impossible unless there are in a flock carrier sheep on whose feet are protected pockets of infection. It has been

An intravenous injection of a sulpha drug cures many cases of foot-rot in cattle.

shown that sheep with sound feet are not harmed by contact with infected animals, and therefore some damage to the feet is necessary before the foot-rot organisms can enter. If there are both carriers and sheep with injured feet in a flock, an outbreak of foot-rot will occur.

Conditions conducive to the damaging of sheep's feet occur during periods of excessive moisture, especially when grass growth is good (contagious foot-rot in New Zealand is a disease of spring and autumn, when pastures are long) or when overgrown, untrimmed feet tend to crack.

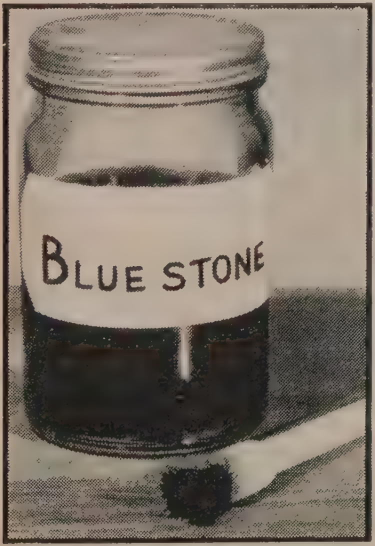
The organisms are deposited on the ground from affected feet and are then picked up by other sheep whose feet have been mechanically damaged so that their resistance to infection is lowered. The habit of sheep of stringing along tracks one behind the other naturally offers every opportunity of infection, the results of which are familiar to all sheep farmers.

The lesion starts with a mild inflammation of the skin between the claws. Then a crack develops between skin and horn, followed by separation of the horn from the underlying tissue of the foot. Within a few days the horn is under-run to the sole, and the sheep is lame. There may be a little greyish and evil-smelling pus formed, but pus is not a characteristic of contagious foot-rot.

If no treatment is given, the condition grows worse and the hoof becomes misshapen and overgrown with a soft, spongy sole. These cases are very lame. When both fore feet are affected the sheep kneels to eat, which is a common sight on sheep country.

Naturally such sheep spend much of their time resting their feet instead of eating and fall away in condition. Much unrecognised economic loss is due to foot-rot.

Contagious foot-rot will persist in affected feet for years and still be able to infect other sheep when opportunity arises.



[*Sparrow Industrial Pictures Ltd. photo.*
Bluestone in strong solution is very helpful in combating foot troubles and a jar ready dissolved, with a brush for applying it, should be kept handy in the shed.

Treatment

Proper preparation of the feet for treatment is most important; a good sharp knife and secateurs should be used. Every pocket of infection must be exposed by cutting away under-run horn, etc. It is better to cut too deeply than to leave areas protected by flaps of horn, as this opening up, rather than the caustic solution applied, brings about the cure. Some really-bad cases may need two or three trimmings at close intervals, especially if a blood vessel is cut and blood hides the infected areas. Such feet should be gone over again in 3 days. Naturally the earlier the case is treated the easier it is to cure.

After the hoof is prepared it must be treated either with bluestone solution or formalin; 30 per cent. bluestone is recommended for individual treatment (3lb. of bluestone to 1 gallon of water) or 10 per cent. formalin. Butter of antimony, which is no better than bluestone, is far too irritant and much more painful to the sheep.

In treating bad cases each foot should be dipped in a jar of 30 per cent. bluestone for half a minute, but if a large number are affected, a foot bath is a necessity. This should be 20ft. long by 1ft. wide and should contain about 1½in. of bluestone solution; 6in. sides to the trough will prevent loss by splashing, though it is also advisable to put a layer of wool in the bath so that no bluestone splashes up on to the wool. As strong bluestone solution causes damage to the fleece which is revealed during processing, formalin, which does not affect the wool, is often used in foot baths.

If large numbers of affected sheep are to be treated, they should be allowed to stand 5 minutes in 30 per cent. bluestone, but for prevention alone 5 minutes in 10 per cent. bluestone is adequate.

It cannot be too strongly emphasised that if treatment of bad cases of foot-rot is to be effective, it must be done once a week at least. All but the most persistent cases should be cleared up in 2 weeks of this treatment at the longest, and sheep which do not respond are better sent to the works.

Eradication of Foot-rot

It is much better to rid a farm of foot-rot than to have to be constantly treating affected feet. As after a 2 weeks' spell a paddock will be free from *F. nodosus* and *S. penortha*, sheep free from foot-rot placed in a spelled paddock would not develop foot-rot. However, it is most important that these sheep should be carefully examined and the whole mob put through a foot bath just before they are released in the clean paddock.

If every infected sheep, no matter how slightly affected, is segregated in a hospital paddock and treated at 3-day intervals by paring the feet where necessary and dipping them in bluestone, the whole farm can be freed from contagious foot-rot if care is taken not to recontaminate clean paddocks.

Naturally, any sheep brought on to the farm would have to be quarantined until their feet had been examined and treated in the foot bath.

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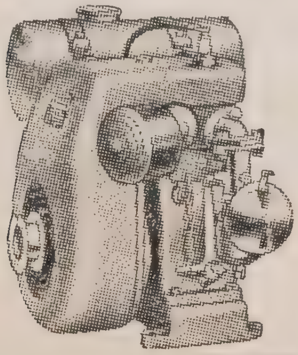

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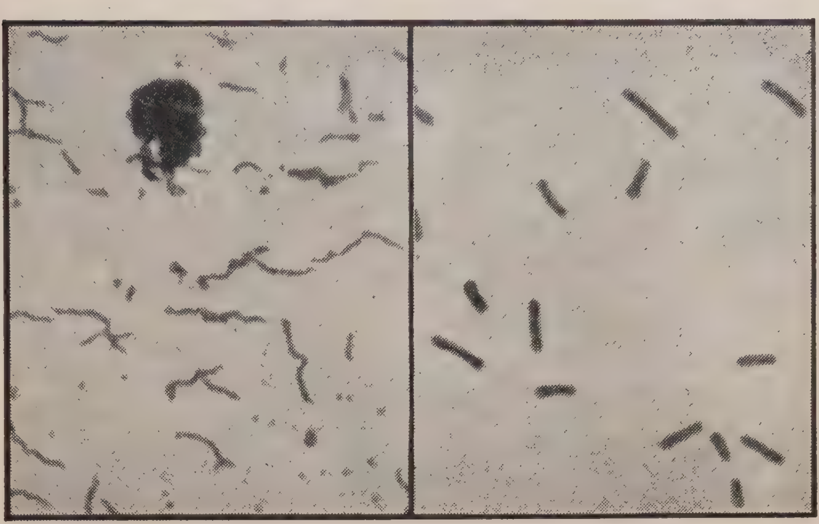
Summary

- (a) Contagious foot-rot is spread by carrier sheep. The organisms concerned do not live long away from infected feet.
- (b) Development of foot-rot is favoured by warm, damp climates when pasture growth is good. Note: Wet conditions alone will not cause foot-rot in the absence of *F. nodosus* and *S. penortha.*
- (c) Carrier sheep are responsible for outbreaks recurring on apparently-clean farms.
- (d) Treatment to be effective must be thorough.
- (e) Control by use of hospital paddocks for affected animals and spelling of paddocks for at least 2 weeks is not complicated. It is a fairly-easy method of getting rid of foot-rot and one that should be readily put into operation, particularly on fat-lamb farms.

Non-contagious Foot-rot (Foot Abscess)

Non-contagious foot-rot or foot abscess of sheep is produced, as in cattle, through softening of the horn or damage to the skin between the claws allowing entry of *Fusiformis necrophorus*, which produces a typical abscess with creamy pus under the horn or in the cleft. Often only one claw of one foot is affected. In advanced cases the infection may involve joints and may proceed along the tendon sheaths to break out higher up the leg. In these cases treatment is usually hopeless and the animal dies from toxaemia due to the absorption of poisons from the infected leg. Less-advanced cases are best treated by paring the hoof and allowing the pus to escape through adequate drainage. The hoof should be dipped in 30 per cent. bluestone. Most of these cases will eventually recover if the pus is allowed to get away. If stud sheep are affected, the services of a veterinarian to administer intravenous sulpha drugs would be valuable.



Snake-like spirochaetes and *Fusiformis nodosus*, the organisms which together cause contagious foot-rot in sheep,

[*Sparrow Industrial Pictures Ltd. photo.*
Hoof cutters and foot-rot shears, useful implements for trimming hoofs of cattle and sheep.

F. necrophorus is a common inhabitant of soil and mud, and even slight damage to the hoof allows entry of the organism. Spelling paddocks and quarantine of affected sheep will not help with this type of foot-rot.

Scald

Scald of the skin between the toes of sheep occurs frequently, especially when grass is rather long and wet, and is probably due to abrasions caused by the wet grass dragging between the toes. Scald itself is not serious, but cases seen should be treated with bluestone because entry of contagious foot-rot organisms, or *F. necrophorus*, may bring on a much more serious condition.

Scabby Mouth

On farms where scabby mouth is prevalent sores frequently appear round the coronets of lambs as well as on the legs and face. Fortunately scabby mouth is easily prevented by treating lambs with a vaccine obtainable from the Department of Agriculture's Animal Research Station at Wallaceville. Little lameness appears to be caused by the sores.

Dipping Lameness

Lameness in sheep after they had been dipped in certain of the new "Gammexane" or rotenone dips was described in "The New Zealand Journal of Agriculture" of May, 1948. Outbreaks of lameness a few days after dipping with the dip preparation were noticed in many flocks. The highest incidence was always in sheep dipped late, when the bath had stood for some days after the original mix. This lameness disappeared in a week or two.

Sheep were very lame and showed symptoms of swollen feet, which were very hot and painful. The cause was discovered to be an organism *Erysipelothrix rhusiopathiae*, which is responsible for a great deal of arthritis in lambs after docking. This bacillus enters the skin of the feet through cuts or scratches, probably due to knocks on the concrete dip. Normally this organism is an inhabitant of many types of soils and is responsible for erysipelas of pigs as well as arthritis in lambs.

Old-type dipping fluids contained an antiseptic which prevented the growth of *E. rhusiopathiae*, but this organism flourishes in a dip mixture which does not contain an antiseptic and which is contaminated by sheep dung, wool grease, and dirt.

To prevent this growth, substances will be added to the preparation to sterilise the dip, but bluestone is quite effective in the proportion of 3lb. of bluestone to every 1000 gallons of dipping fluid in the dip.

PIGS

Foot troubles in pigs are similar to those in cattle. The organism responsible in both cases is very similar and produces very similar results, but in the case of pigs a spirochaete, like the one associated with necrotic ulcers and castration abscesses, is generally found along with the *Fusiformis* bacteria in the affected foot. As with cattle, some damage must occur to break the skin or horn of the pig's foot and allow the germs to enter.

Symptoms of foot-rot in pigs are swollen feet and discharge of pus from the foot, followed frequently by ulcers just above the horn of the claw. When the case is very bad the joints of the lower limb are invaded by bacteria and pus may run along the tendon sheaths and break out higher up.

These cases are practically incurable. Foot-rot sometimes occurs in piggeries where pigs are allowed to run out, and in many of these cases the cause of the original damage to the feet can readily be found in old barbed wire, rough metal in gateways, boards with rusty nails projecting, and many other articles which seem to abound round the piggery.

However, there are more puzzling cases where pigs running on smooth concrete, generally in enclosed piggeries, develop foot-rot. Probably some damage is caused by the concrete wearing down the hoof at the junction of wall and sole and so allowing the bacteria to enter; perhaps the hoof of the particular breed of pig is too small and is easily damaged when it has to carry the weight of a large pig on a hard concrete floor. Much of the trouble occurs in piggeries where the floors are seldom reached by direct sunlight and are usually wet.

Strong bluestone solution kept handy in a bottle and applied with a paintbrush to the feet of any pigs showing the slightest sign of lameness will help to control the trouble. Bluestone foot baths at 10 per cent. strength help where large numbers of pigs are affected, but the feet of pigs running in paddocks should be washed before they enter the bluestone bath.

When a foot is swollen it should be carefully pared at the toe to allow escape of pus and be treated with bluestone.

Some of the sulphonamide drugs have proved helpful in treatment of the condition, but these should be prescribed by a veterinarian.

Affected piggeries must be well disinfected and a flame-thrower is excellent for the job. Flame must be applied thoroughly to all floors and walls, and there is this added advantage that the incidence of necrotic sores will be considerably reduced after this treatment.

Unfortunately it is much more difficult to sterilise paddocks, and if foot-rot or necrotic ulcers are prevalent among a herd of pigs, it is probably best to shift the piggery to a new site and not allow the pigs in the old yards and buildings.

DOGS

An elastic tendon in dog's feet lifts the nail when the claw is not required, so that when the foot is on the ground the weight of the dog is supported by elastic cushions called the pads. Troubles in the feet of dogs are usually due to excessive wear on the pads or to penetrating wounds caused by stepping on sharp objects.

Under normal conditions a farm dog has plenty of exercise and the claws are worn down as they grow, so that the dog does not suffer from overgrowth of horny nails. If the claws become too long and press into the pad, they are easily cut with clippers. Dew claws, the unused equivalent of the human thumb, should be removed from working dogs at the puppy stage.

The main difficulty encountered by a farmer when he attempts to treat injuries in a dog's feet is to prevent the animal licking off any dressings applied and to force the animal to rest the injured part. While pain from the injury is still severe there is no difficulty in enforcing rest, but in the convalescent stage great damage may result if the patient is allowed to run too soon. Close confinement in a kennel is essential in treating wounds of dog's feet.

It is not much use a farmer's putting a bandage on a dog's foot, as he has no means of preventing the animal chewing it off again. For the same reason sutures or stitches should not be used in treating a split pad. A non-irritant disinfectant solution at a strength of 1 : 1000 is very useful, as it does not cause the animal to chew the foot.

Rapidly-drying tinctures such as tincture of iodine or tincture of metaphen are also very healing, but as they cause smarting, the dog should be held until the application has dried. To ensure rapid healing of the surface of worn and burnt pads the use of 1 per cent. picric acid solution is effective.

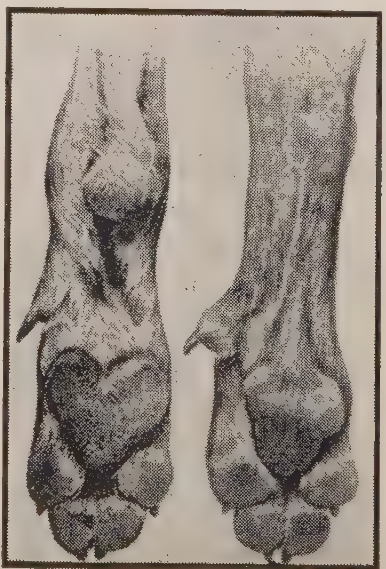
Puncture Wounds of Feet

Puncture wounds of dog's feet should be carefully examined for splinters or pieces of glass. Foreign bodies and thorns are extracted more easily if the foot is first bathed in hot water. The injured area should afterward be painted with tincture of iodine and the dog given a few days' rest.

Cuts in the pads should be treated similarly.

Abscesses or Cysts between Claws

Long-haired dogs are particularly subject to abscesses or cysts between the claws, but all breeds are susceptible.



Pads of right fore paw (left) and right hind paw (right) of a dog, which bear the dog's weight.

Grass seeds or dirt lodging in the tender tissues between the claws can start this trouble. Swellings may be found between the toes when the dog is seen to be going lame. If they are treated early by painting with iodine for a few days, these swellings may go down, but generally they are difficult to treat, particularly if they are cysts. If a splinter or grass seed can be found or squeezed out after bathing the foot, the abscess will soon heal, but cysts should be opened and iodine either injected with a syringe or the interior of the cavity probed with a swab of cottonwool on a match stick dipped in iodine, the object being to destroy the lining of the cyst, which will otherwise recur.

Inflammation of the Pads

Inflammation of the pads is very common in drovers' dogs and in dogs working in hard country. When the dog is working little lameness is noticed, but after he has rested for a time the feet become very sore and the dog very lame. The pads are found to be hot and swollen and may even be worn to the flesh. Rest is all-important. Bathing with water and the use of a mild disinfectant are helpful, and if the pads are very much worn, frequent applications of a non-irritant disinfectant (1 in 1000 solution) will prevent worse trouble developing through bacterial infection.

Horny Growths on Pads

Horny growths on the pads of dogs' feet should be pared away and treated with iodine. They are difficult to treat and generally recur.

Wire or String Round Foot

Occasionally a ring-shaped wound is apparent round a dog's foot and the animal is noticed continually licking the affected paw. Careful examination will reveal either string or wire round the foot, often almost buried in the hair and skin. The encircling material should be cut and extracted, after which warm foot baths will help to restore circulation to the area.

Crushed Paws

If a dog has a foot crushed by the wheel of a dray or other farm implement passing over it, any loose pieces of skin or bone should be cut away and the paw washed in warm antiseptic baths. After this, treatment on the farm is best confined to the use of a dry, non-irritant dusting powder such as calamine, talcum, or sulphanilamide. The dog will have to rest until the damage is healed.

CATS

Foot troubles in cats should be treated on the same general lines as those recommended for dogs, though very often the animal disappears and treats itself successfully. If dog bites on the legs or trap wounds, which are common in cats, are found early enough, application of hot water (or, as cats are afraid of water, hot foments with towels wrung out) will help to restore circulation. Any abscesses occurring should be opened for drainage and treated with sulphanilamide powder or tincture of iodine.

Use of Broad Beans as Shelter in Home Garden

MANY household vegetable gardens are classed as "cold" in winter and spring and are therefore considered useless until the weather becomes warmer. Ground may be cold for several reasons such as exposed situation, overshadowing by buildings or trees, or heavy soil with bad drainage. A method of overcoming the disadvantage of an exposed situation is explained in this article by J. L. Nicholas, Fruit Inspector, Department of Agriculture, Nelson, who describes the results obtained from sheltering tomatoes with broad beans in the Nelson district during a cold spring.

IT has been shown by experience in the field that commercial growers in open country have gained considerable benefit from the practice of growing through crops belts of maize planted at right angles to the general direction of the prevailing wind and spaced a chain or two apart. In a domestic garden growing vegetables may be used in this way as shelter and so yield a crop as well as provide shelter.

Though these plants in the sheltered row are somewhat uneven, their average height is about 20in., compared with the average height of about 9in. of the unsheltered row.

A belt of broad beans was sown in a home garden in the Nelson district in June as a shelter for the spring planting of tomatoes. The plot of garden selected was exposed to the full blast of the cold south-west winds, which in a cold spring in Nelson retard vegetable crops considerably.

Arrangement of Beans in a Double Row

The belt of broad beans was sown on the exposed side of the patch intended for tomatoes in the spring. These beans, which were a second and late crop, were sown staggered in a double row so that each bean was about 5in. from its neighbours. The tomato plants, which were a tall variety, were planted on the sheltered side of the broad beans when the beans were about 18in. high. One row was planted 2ft. from the beans and the other 6ft. 6in. from the beans, with 4ft. 6in. between the two rows of tomato plants. Manurial and spraying treatment were the same for the two rows of tomato plants.

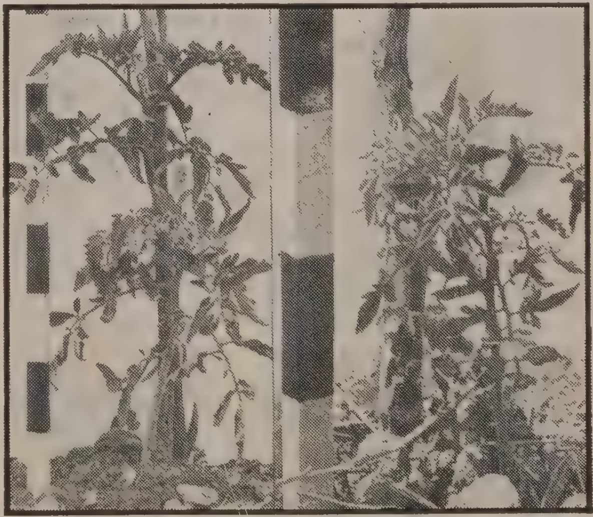
The advantage gained by the use of shelter is shown by the comparison between the sheltered and unsheltered plants in the accompanying illustrations. The average height of plants in the sheltered row was about 20in. and in the unsheltered row about 9in. It is considered that if another row of broad beans had been grown between the two rows of tomatoes, the unsheltered row would have benefited also.

The two rows of tomato plants, showing the gap in the background which was open to the wind. The relatively-exposed row is in the foreground, with the sheltered row close to the broad bean plants used as the shelter belt. The black and white sections on the marked stakes are 3in. long.

Rows of plants grown as shelter should be arranged at right angles to the direction of the prevailing wind. If one row is not deemed sufficient, two rows in an L-shaped formation may be tried, planting being arranged so that the right angle of the L faces the direction of the prevailing wind.

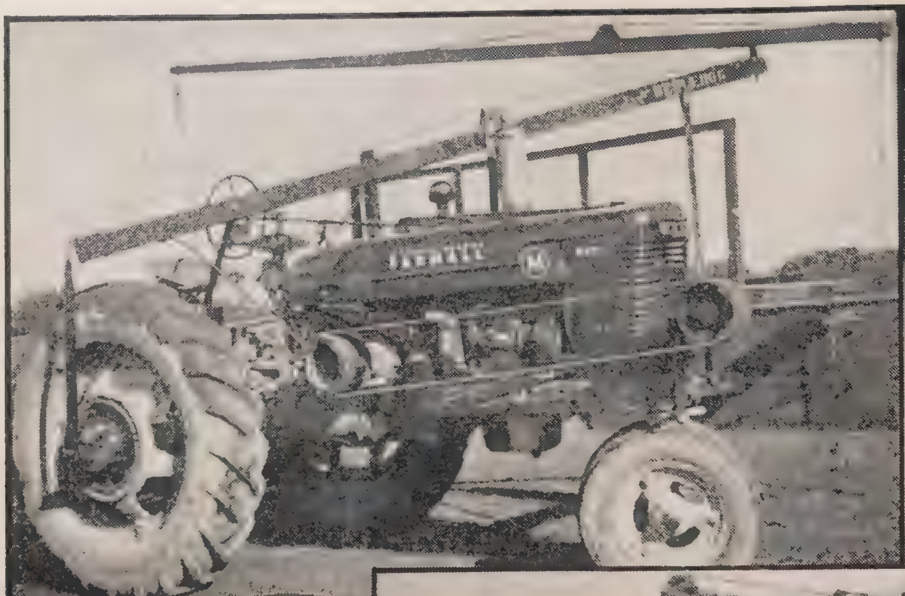
Good Drainage and Fertile Soil Essential

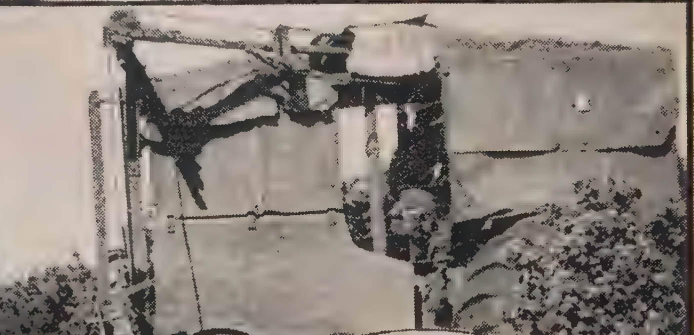
Though shelter can improve the growth of plants in cold ground, it can be beneficial only if all other conditions are favourable. Good drainage and fertile, loose soil are essential. The soil in the plot where the tomatoes were grown was of a clayey nature, but the digging in of straw and similar material and the addition of nitrogenous manure helped to loosen it considerably.



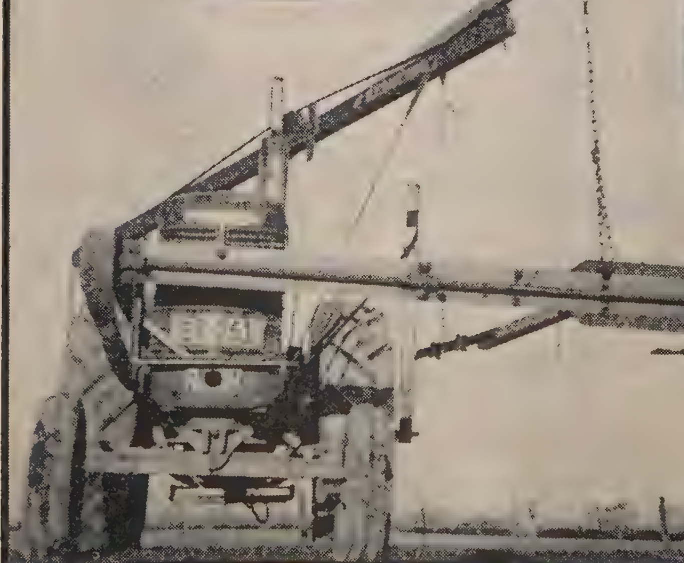
The difference in growth between these two plants can be gauged from the 3in. black and white sections of the marking stakes. Left—A plant from the sheltered row about 20in. high with one truss flowering and the second in the crown. Right—A plant in the unsheltered row about 9in. high with no truss flowering.

MECHANICAL CUTTING of GORSE





Top and bottom—The self-mounted type of gorse cutter fitted to a farm tractor. Below—A gorse cutter specially adapted for "mowing" roadsides or neglected gorse on arable country.



Upper circle—The gorse cutter mowing a neglected area. Lower circle—Roadside gorse over which the mechanical cutter has passed. This area could be ploughed if necessary.

HEADING PHOTOGRAPH

These dense, well-kept gorse fences on a South Canterbury farm have been cut mechanically for 3 consecutive seasons.

Mechanical Cutting of Gorse Hedges

THE advent of the mechanical hedge cutter has contributed much to the value and appearance of parts of the New Zealand countryside where gorse hedges predominate. Many farms in Canterbury have several miles of gorse hedges, and during the depression years the expense of hand cutting could not be borne, resulting in overgrown and damaged fences and the gradual spread of gorse plants into adjacent fields. In recent years increases in wages and contract rates and difficulty in obtaining labour for the work would have made the position still more difficult and might have resulted in the eventual destruction of live fences. Fortunately mechanical cutting has solved the problem, and a job which would have taken a man all winter to do by hand can now be handled in a matter of days. In this article J. Forrest, Assistant Fields Instructor, Department of Agriculture, Timaru, traces the history of the machine and describes its operation.

GORSE fences are so much a part of the rural scene in many parts of New Zealand that it is difficult to imagine their not being used. The appearance of a farm is improved greatly by well-kept hedges, and their value as shelter is difficult to assess. A gorse fence in good order can be maintained permanently at the expense of an annual or even biennial cutting, and in these days of scarce and expensive fencing material attention must be given to the maintenance of live fences. The bringing back of gorse fences which have been allowed to deteriorate would have been a major undertaking both practically and economically without the aid of the mechanical gorse cutter.

Development of Gorse Cutter

Until about 1895 practically all maintenance work on gorse hedges was done by hand—a slow and laborious task. At Kirwee, Canterbury, about this time several farmers, dissatisfied with manual cutting over large areas of gorse fences, agreed that some machine could be designed to solve the problem. Some time later an invitation was extended to all interested farmers throughout the district to attend a competition to be held at Courtenay for home-assembled cutting machines. By this time several farmers had become interested in the idea and a successful demonstration was expected, but the entries were very disappointing, only three machines being shown.

However, that did not dampen the enthusiasm of the many interested onlookers, who were keen to see the capabilities of these new machines. Built on trailers and drawn by horses, these three machines met with varying success during the day. Very little cutting was achieved, but much valuable knowledge was gained. Many critical onlookers viewed the machines as a farce, but that day was virtually the beginning of the life of a machine which farmers in Canterbury now consider a valuable addition to farm equipment.

After these primitive horse-drawn machines came the improved cutter mounted on a heavy traction engine. This proved a valuable step toward successful mechanical cutting, because previously trouble had been experienced in adapting a gearing system for driving the knife in relation to the speed of travel. That trouble was overcome by the harnessing of mechanical power, but then instead of insufficient power there was too much. Despite all attempts to strengthen the framework of the machine, major breakages occurred frequently.

While the machine was undergoing many alterations an attempt was made to adapt it to a lighter tractor, but lack of experience and inability of the small tractor to handle the heavy machinery resulted in the tractor becoming badly strained. However, soon after, this tractor was again tried with a newly-constructed, light, self-centred machine built on it. This light tractor proved ideal for the work, and in 1918, again at Kirwee, the hedge cutter went through its final stages of major improvements.

The ease with which this light tractor could be manoeuvred by the operator in comparison with other earlier machines was alone sufficient to warrant its use, but its economy was the major improvement. The cost of operating and the initial cost of the machine were reduced to figures enabling a farmer to buy and operate his own machine economically.

Types of Cutters

All present-day gorse cutters in New Zealand are based on improved designs of the original machines tried at Kirwee. Two main types are being operated successfully by farmers—the self-mounted type, mounted directly on a tractor, and the trailer type.

Self-mounted Type

With modifications, a small, lightly-built cutter can be fitted to practically any class of farm tractor. For ease of operation the main knife shaft and beam are supported by a wooden stay bolted to the body of the tractor, allowing the weight to be distributed over the four wheels. Before this type of self-centring was used much strain and wear were thrust on the steering mechanism and wheels of the tractor.

A variation in construction is necessary when this type of cutter is adapted to a crawler tractor, on which the power pulley is at the rear beneath the seat. A special frame is built and attached to the back of the tractor. Built into the framework is a countershaft on which are two pulleys, one connected in a straight drive to the tractor pulley, the other driving forward to the main shaft on which the knife operates.

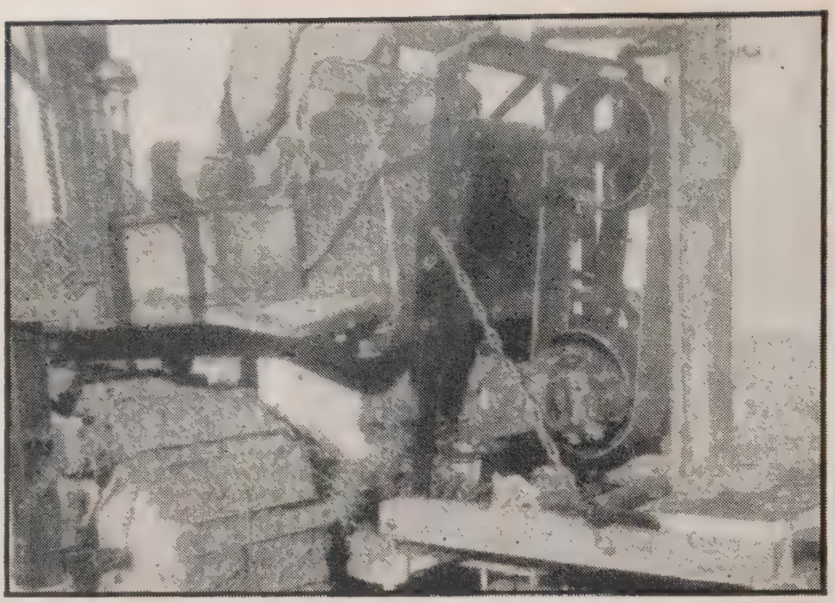
As this type of cutter is not fixed permanently to the tractor, being used only for seasonal work, the framework and attachments must be built in a manner enabling the complete structure to be assembled and dismantled without great difficulty.

GORSE CUTTERS . . .

Trailer Type

Built on a trailer and operated as a separate unit, the trailer type of cutter derives power from the power take-off shaft at the rear of the tractor beneath the seat. No special attachments are necessary for the trailer, which is hitched to the drawbar of the tractor in the usual way.

For even cutting the knife operator depends on the tractor driver for his line. The work requires much skill on the part of the operator and driver, because both have to watch ahead for obstacles while the machine is in action. Many fences, particularly those being cut mechanically for the first time, are dangerous to the operators and can cause serious damage to the machine. Such obstacles as loose fencing wire, iron standards, and plough shares may be concealed from the operator and yet be in the line of cut. Therefore the operator cannot afford to be distracted by an erratic course taken by the tractor, as danger to the men can be avoided only by their own careful work.



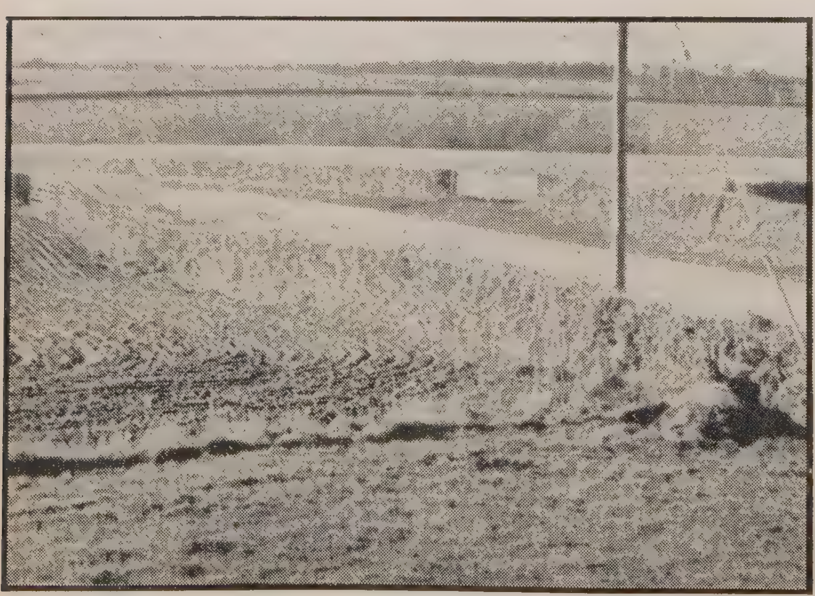
The type of power drive required for a gorse-cutting machine mounted on a crawler tractor.

Method of Operation

The first task in preparing the machine for operation is the setting of the knife, which should cut into the hedge on its forward swing and fly clear as it swings back. It should leave the fence slightly wider at the base than at the top, which serves two purposes, stimulating growth at the base of the fence, allowing light to reach the growing gorse more readily, and leaving the fence thicker and stronger where stock are most likely to attempt to breach it

The knives should be reasonably sharp so that the cut is clean instead of the sticks being bruised and splintered, but nothing is gained by attempting to keep them too sharp. These knives, the efficiency of which depends on the speed at which they travel, are driven at from 800 to 900 revolutions per minute by a belt drive. The required number of revolutions can be ascertained by experience and by knowing the gear ratio of the tractor, but is usually obtained by operating the tractor in low gear and throttled right down.

Should any damage occur to the knives from such causes as striking stones or iron standards, they can be repaired readily by being heated in a forge, beaten into their true shape, or drawn out if the ends are broken, the edges reground, and the blades retempered.



With careful operation a mechanical gorse cutter can make a good job of fences near power poles and gateways.

Time to Cut Gorse

Late autumn is the ideal time for cutting gorse hedges. The rapid growth is past then, but the fence will continue to put on some growth to carry it over the winter.

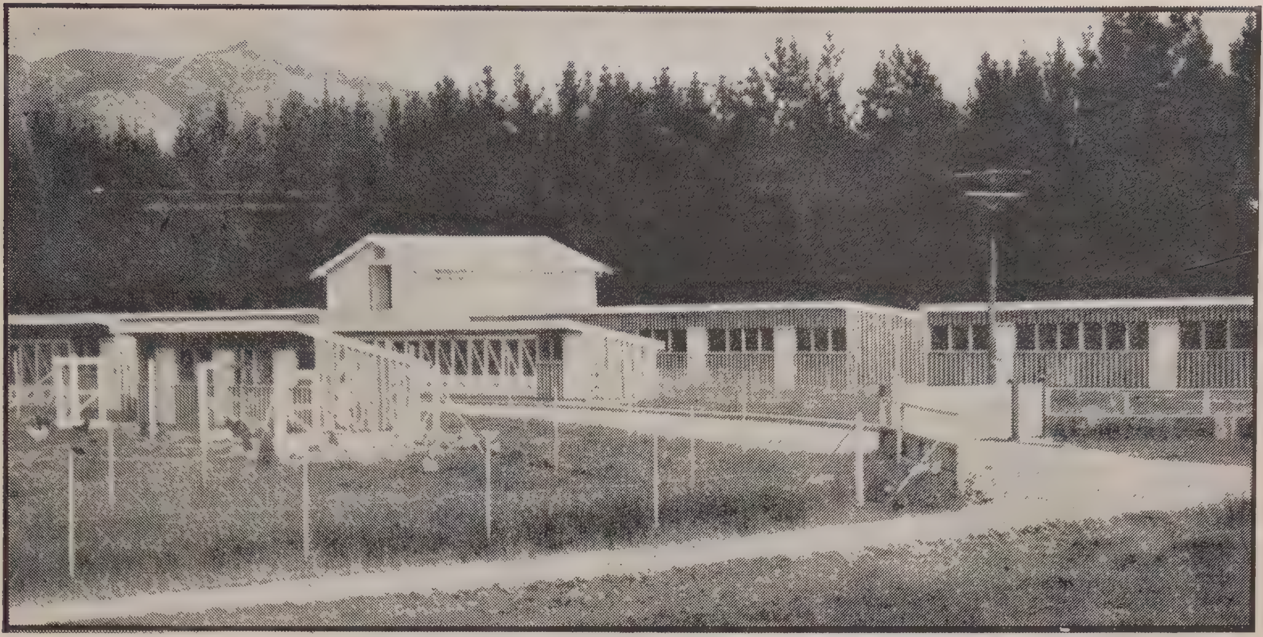
Though annual cutting undoubtedly is best for producing and maintaining a thick, vigorous fence, quite good results are obtained by cutting the tops each year and the sides in alternate years; that procedure should be adopted with a fence which has been neglected for some years.

Control of Roadside Gorse

Free-growing roadside gorse is a worry to the farmer, particularly where it has been neglected for several years. A large proportion of Canterbury farms are surrounded by gorse fences and many boundaries border roadsides. The spread of gorse in the fields is not of serious concern where cropping and grazing are carried out extensively, but the roadside gorse presents a serious problem.

Where the gorse has been left for several years mowing with the cutter preparatory to further control by ploughing has proved very successful. Often this method of cutting has been sufficient to control the growth of the gorse. The tractor travelling over the bruised gorse stumps tends to kill a certain amount, though not sufficient to make the operation complete.

The mechanical gorse cutter has several advantages. The cutter arm is adjustable, enabling the hedge to be topped at whatever angle is required and telegraph poles to be negotiated without difficulty. The only piece missed when the inner sides of the fence are cut is the length of the tractor in each corner from which a start is made, and these small sections may be hand cut by the man who is cleaning up behind the cutter.



External Parasites of Poultry

IN common with other livestock, poultry are afflicted with various external parasites, such as lice and mites, which, though not usually very serious if occurring in only small numbers, may cause considerable loss if allowed to multiply unchecked. In this article A. C. Howse, Poultry Veterinary Officer, Department of Agriculture, Wellington, describes some of the commoner external parasites of poultry and the measures which should be taken to control them.

LICE are among the commonest external parasites with which poultry are affected and are well known to most poultry farmers. They are small, flat insects which live and feed on the surface of the skin, where they can be seen running about with great activity if the feathers are parted, particularly in the region of the vent. Those on fowls are biting lice, and feed not by sucking blood but on fragments of skin and surface debris. The entire life cycle is spent on the body of the host, where the female parasite lays eggs which are attached to the feathers near where they issue from the skin. In heavy infestations numerous clusters of these eggs, or nits, can be seen at the bases of the feather shafts near the vent, resembling masses of sugar in appearance.

The eggs hatch 5 to 7 days after they are laid, and the young lice which issue become mature about 2 weeks after hatching. Their biting causes considerable irritation, restlessness, and loss of condition in the birds. Unless they are watched for by frequent handling and examination of birds, they may easily escape detection.

The most convenient method of treating lice on poultry is fumigation with nicotine sulphate in 40 per cent. solution by painting a thin line of the solution along the upper surfaces of the perches about half an hour before the birds go to roost. The heat of the birds' bodies vaporises the nicotine during the night so that the fumes rise among the feathers and poison the parasites.

Care should be taken that only a 40 per cent. solution of nicotine sulphate is used and not the pure form of the drug, which is much too powerful and will poison not only the lice but also the fowls.

The house should be reasonably well ventilated, but not to such an extent that an adequate concentration of vapour is prevented. When an open-fronted house is to be fumigated a quiet night with no wind should be chosen and, if practicable, part of the open front should be blocked with sacking.

This treatment should not be carried out in houses which have been lime washed recently, as the lime causes excessive vaporisation of the nicotine and may make the fumes too powerful.

The fumigation has no effect on lice eggs, so the treatment must be repeated at least once after an interval of 8 to 10 days to kill lice which hatch out subsequently.

The solution is highly poisonous, so care should be taken that it is kept out of the reach of children and other irresponsible individuals.

Where only a small number of birds is kept they can be dusted with sodium fluoride, but that entails catching and treating each bird. The powder should be dusted well into the feathers so that it comes in contact with the skin, and this treatment also should be repeated 8 to 10 days later.

Red Mite

Another common parasite is the red mite, a minute, 8-legged creature, related to the itch mite which causes itch or scabies in man, to the parasites which cause mange in dogs and other animals, and to scab in sheep. Though known as the "red" mite, the parasite is normally grey and appears red only when engorged with blood. Most poultry keepers have seen these parasites, as they are very common. They breed very rapidly, so that a heavy infestation can be built up in a short time and may escape detection if the poultry keeper is unobservant.

The parasites feed intermittently, and when not feeding they hide in cracks and crevices in the houses and at the ends of perches, where they can be seen in enormous numbers as minute red or grey specks, according to whether or not they are engorged with blood. If a perch in an infested house is removed, large numbers of parasites will be seen in the socket, and in and near the same place will be a fine, silvery powder, consisting of the shed skins of the parasites, which change their outer covering

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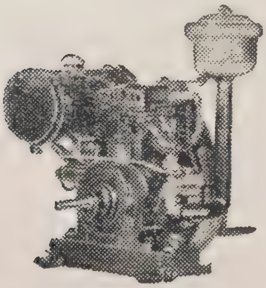

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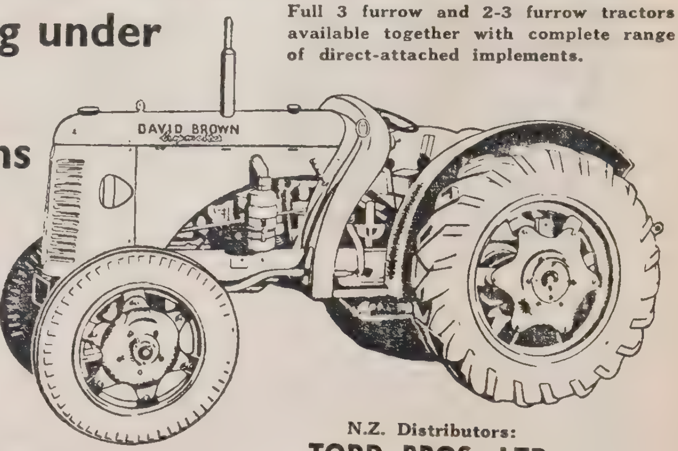
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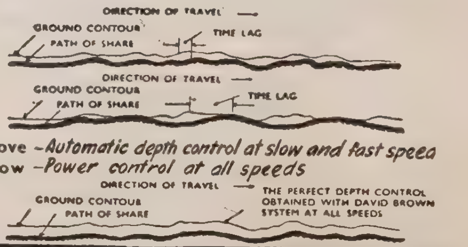
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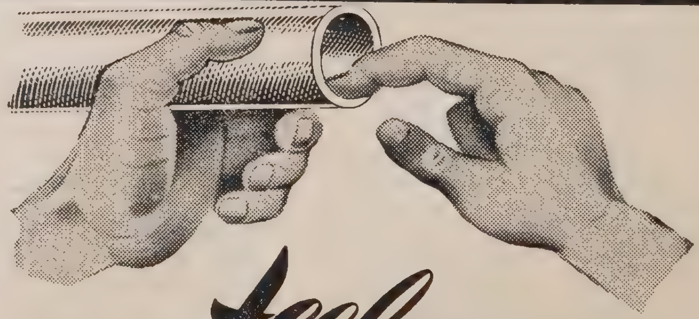

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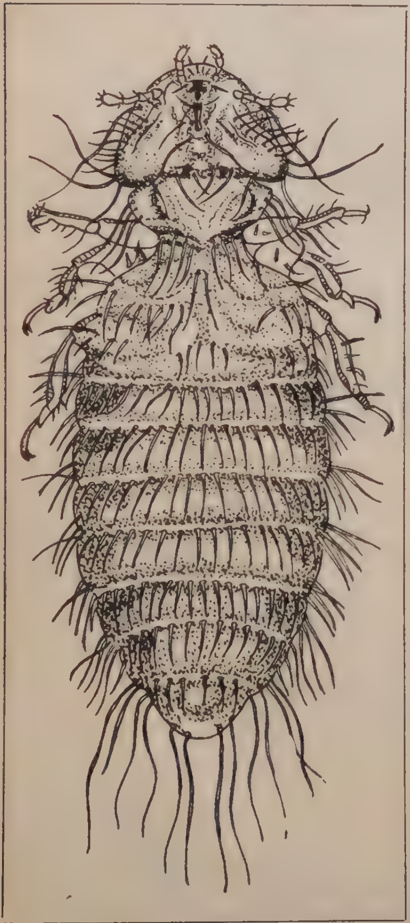
REID NEW ZEALAND RUBBER MILLS LTD. • GREAT SOUTH ROAD, AUCKLAND from time to time. At night they leave these hiding places to crawl along the perches and on to the fowls, where they cause irritation and loss of condition by sucking blood.

Fortunately infestations, though common, can be dealt with easily by spraying the inside of the house with either kerosene or creosote, taking particular care to see that the liquid thoroughly penetrates all crevices and perch sockets. Perches should always be detachable, and the ends should be well soaked in the liquid, the whole perch also being sprayed. Creosote has the advantage that it preserves the woodwork as well as destroying the mite, but it makes the interior of the house very dark. If it is used, it is as well to paint or spray the outside of the house with it at the same time, or the mites may retreat before the advancing tide of destruction and escape. The house being then thoroughly coated with preservative, a double purpose will have been served. For the destruction of the parasite similar considerations apply to treatment with kerosene, but apart from that spraying the outsides of houses with kerosene would serve no useful purpose and would be extremely expensive.



[*After Reis and Nobrega in "Diseases of Poultry," Collegiate Press, Iowa, U.S.A.*

A male common poultry louse.

After the house has been treated the birds can be given a single fumigation with 40 per cent. nicotine sulphate, as described for lice, to destroy any mites which were on them at the time and thus escaped the spraying.

Recent overseas experiments in which houses infested with red mite were sprayed with D.D.T. are reported to have achieved most promising results, one spraying with a 1 per cent. solution having been sufficient to destroy heavy infestations. The D.D.T. apparently has a powerful after-effect, killing any mites setting foot on sprayed surfaces for a considerable time after they have been treated. It is rather early at present to recommend this for general use, but if it becomes possible to try it in New Zealand, the results may be reported later.

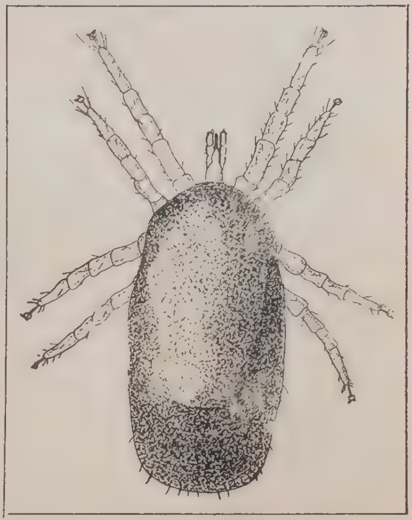
To prevent red mite infestation the first consideration is to ensure that the house is well lit by adequate window space and, where possible, by whitewashing of the inside walls. Dark and dismal interiors favour the development of the parasites, which dislike strong light. Of almost equal importance is having all perches detachable so that they can be removed and inspected frequently and treated if necessary. An infestation can build up very rapidly without being noticed, so a sharp watch should be kept for the mites.

Scaly Leg

A form of mange, scaly leg is caused by a very small 8-legged itch mite which burrows and feeds under the scales of the legs. It is similar to scabies of man and mange of dogs and cats, which are also caused by mites burrowing under the skin. In scaly leg the parasite spends all its time on the infested bird, breeding and laying eggs in the tunnels and channels caused by its burrowing, where the eggs hatch and the young mites grow to maturity. The irritation which results is intense, causing loss of condition, sometimes lameness, and the formation of powdery crusts beneath and between the scales, which are raised from the surface, causing the legs to look thicker than normal.

Fortunately the parasites which cause this trouble are easily destroyed. A common and well-known remedy is to dip the legs of affected birds twice or three times a week in ordinary kerosene, which will penetrate the damaged tissue and kill the mites. If time permits, it is better first to soak the legs in warm, soapy water to soften the crusts and scales and assist penetration by the kerosene. As kerosene is rather severe in its effects, the use of 1 part of kerosene to 2 parts of raw linseed oil is safer, and even that is extremely irritant, so care should be taken that it does not get on the skin of the leg above the scales or on any other part of the body.

If the kerosene is applied every few days, usually a cure is soon effected. A watch should be kept to see that the condition does not recur, but no further trouble should be experienced if it has not gone too far in the first instance.



[*After U.S. Dept. of Agriculture Bulletin reproduced in "Diseases of Poultry," Collegiate Press, Iowa, U.S.A.*

A female red mite, greatly engorged with blood after feeding (much magnified).

Depluming Scabies

Another form of mange, depluming scabies occurs extensively overseas and may cause trouble in New Zealand. It results from the activities of another very small itch mite which lives and feeds at the bases of the feathers, causing such intense irritation that the affected bird pulls out its own feathers, though other causes may also result in fowls losing their feathers. If the existence of this form of mange is established, generally it yields readily to repeated applications of sulphur ointment, obtainable from any chemist, and made by mixing 1 part of finely-divided sulphur thoroughly with 4 parts of petroleum jelly or lard.

This article, though by no means complete, covers most of the external parasites which commonly affect poultry. Anybody desiring further information, or help with a particular case, should communicate with the Department of Agriculture Veterinarian for the district or with the Poultry Instructor. In case of a serious outbreak of poultry disease the owner should communicate with the Poultry Veterinary Officer, Department of Agriculture, P.O. Box 3004, Wellington.

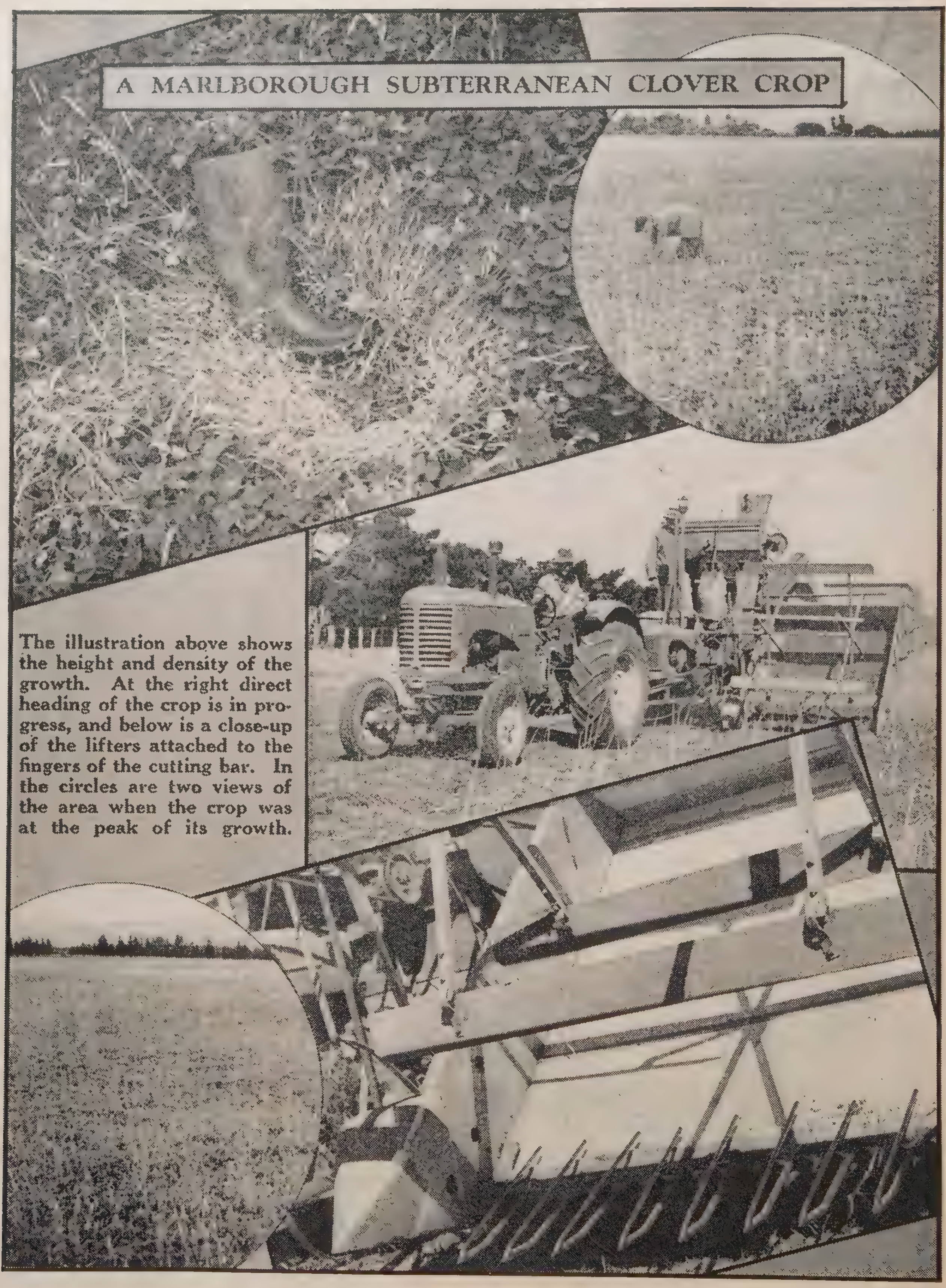
Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in February as under:—

Auckland—1YA, on February 22, at 12.35 p.m., "Good Housing Pays," by H. H. Preston, Supervisor, Northland District Pig Council.

Napier—2YZ, on February 11, at 7.15 p.m., "The Correct Approach to Winter Feeding," by H. A. Hopkins, Supervisor, Tairawhiti District Pig Council.

A MARLBOROUGH SUBTERRANEAN CLOVER CROP



The illustration above shows the height and density of the growth. At the right direct heading of the crop is in progress, and below is a close-up of the lifters attached to the fingers of the cutting bar. In the circles are two views of the area when the crop was at the peak of its growth.

[*Snapshot House photos.*

Harvesting an Outstanding Subterranean Clover Crop

By R. THAINE, formerly Assistant Fields Instructor, Department of Agriculture, Blenheim.

SUBTERRANEAN clover has been recognised as a valuable seed crop for almost a decade and profitable yields have been secured in Marlborough fairly consistently. However, success in harvesting depends more on the weather than is the case with most other cash crops. A yield of 180 to 200lb. is generally recognised as a good payable return, but under efficient management and with favourable weather subterranean clover can yield far more. The area grown by Mr. M. Walsh, of Fairhall, Marlborough, gives an excellent illustration of the capabilities of the crop.

[*Snapshot House photo.*

Portion of the crop after threshing had been started.

THE land is of medium-light soil type with a sandy subsoil containing small gravel throughout. This freely-drained soil is easily worked except during summer. The land becomes very hard and dry during January and February, giving the required conditions for the harvesting of a subterranean clover seed crop.

The crop was sown under barley at the rate of 10lb. an acre, with 2cwt. of reverted superphosphate. Both barley and subterranean clover were sown in autumn, the clover being broadcast immediately after the barley had been drilled. This operation was followed by a final harrowing and rolling.

The clover was well established when the first frosts were experienced, though no excessive growth had been made at that time. No stock were allowed on the area in the first year, the crop being allowed to continue growth through the winter without any check, the objective being the securing of a barley crop, but the growth of the subterranean clover gradually smothered the barley, making harvesting impracticable. In the spring the clover was therefore allowed to mature, and the harvesting of this crop was begun on March 21, 1947.

Harvesting Method

The harvesting of subterranean clover seed has never been straightforward and this crop did not prove any exception. Part of the crop was cut with a mower and threshed with a header picking up the material from the swath. It was later found that the crop could be direct headed with considerable success, and the remainder was handled thus. Special lifters attached to the cutting bar gave better clearance of the material from the ground; these lifters are an essential part of the machine. The threshing drum was of the rub-bar type, which proved quite efficient, giving only a trace of broken seeds. The threshed material was put through the machine a second time, and it was estimated that in all 80 to 85 per cent. of the seed was secured, giving a final yield of 750lb. of machine-dressed seed to the acre.

The field was left with a good covering of seed which could not be picked up for threshing. The area was then disced twice, harrowed, and rolled, which worked the crop refuse into the surface of the soil and produced a desirable seed-bed. Just before the final working 1 ton of lime and 1cwt. of superphosphate per acre were applied. The surface was left rolled.

Second Year's Crop

After the first rains in autumn an excellent strike of subterranean clover resulted without any more seed being sown. That gave an early start, permitting winter grazing, which was continued until early August. After the area had been closed the growth was both even and vigorous, having no competition from weed or crop species.

The next season the crop was again headed direct and has proved most satisfactory. The sample of seed is far superior to the majority produced, for the only impurities are a few split seeds and a trace of dirt. The efficiency of threshing was greater than the year before, and it was estimated that only 10 per cent. of the burrs were left on the ground. The greatest loss of seed occurred through the failure of some of the burrs to release their seed when threshed, but that loss was not excessive, and as the header was required for other work, this material will not be threshed again.

The yield in the 1947-48 season was 1260lb. of machine-dressed seed per acre (7 180lb. sacks), which makes a total yield of 2160lb. per acre for the two harvests.

Mr. Walsh does not intend to take seed from this area this year, as he considers it likely that after two years of harvesting weed infestation may hinder the efficient handling of the seed crop. The paddock is in excellent heart to produce a cash crop, after which it would not be unreasonable to expect that the subterranean clover will establish itself again. Handling the clover crop in this way builds up fertility and adds humus to the soil, yet no monetary return is lost, for a cash crop is produced at the same time.

Unfortunately this method of harvesting subterranean clover seed cannot be applied generally, but on a considerable area in Marlborough the crop could be direct headed if seed areas were managed accordingly. The most desirable requirement is the greatest possible bulk of subterranean clover which is not contaminated by other species. Heavy growth produces a maze of vines which tend to hold the burrs above the ground and so make it possible for the crop to be lifted on to the conveyer canvas of the header without loss of seed. Surface stones limit the use of this method, for extensive damage can be done to a machine if only one small stone finds its way to the threshing drum.

This crop record gives some idea of what is possible when favourable weather can be combined with efficient management.

WEEDS AND SEEDS INJURIOUS

ANY factor influencing the value of the wool clip is of major importance to New Zealand as a whole and weeds which produce seeds or burrs that devalue wool and sheepskins as industrial products are the concern of every farmer. In the following article R. G. Montgomery, Sheep and Wool Instructor, Department of Agriculture, Hastings, deals with several weeds common to various parts of the North Island and gives the generally-accepted common name and the botanical name of each species, with a short description of the seeds and the manner in which they affect the woollen industry.

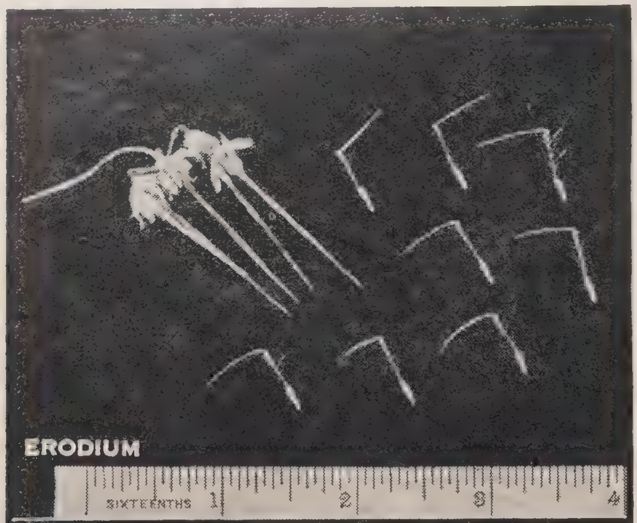
FARMERS should note the name of each weed and use it when referring to the particular seed or plant, as that would obviate much of the confusion caused through common plants being known by two or more different names on adjoining farms.

Stork's Bill

Stork's Bill (*Erodium*) is also known as crow's foot, sheep's parsley, 12 o'clock, and corkscrew. Farmers often confuse the plant with wild parsnip or wild carrot and it is sometimes misnamed black jack by wool buyers and brokers. Black jack (*Stipa variabilis*) is a totally different plant, with a longer though similarly-awned seed, which has a bad reputation in Australia and is known in some parts of Banks Peninsula and Marlborough.

The botanical name *Erodium* comes from the Greek "erodios," a heron, no doubt because of a fancied resemblance between the head of the bird and the seed head of the plant. The seed has a long awn which, as it matures or dries, will wind itself into a tight spiral, the awn turning with a circular motion. The awn is hygroscopic—when the tightly-coiled shaft becomes damp it will immediately begin to unwind, and it is this ability to wind and unwind which gives this type of seed such a bad reputation in the woollen industry.

There appears to be difference of opinion as to whether the *Erodium* species are annual or perennial, but most authorities consider them annuals or possibly biennials. Three species are recorded in New Zealand, *Erodium moschatum*, *E. cicutarium*, and *E. malacoides*, with some doubtful hybrids. The plant has a deep tap root, trailing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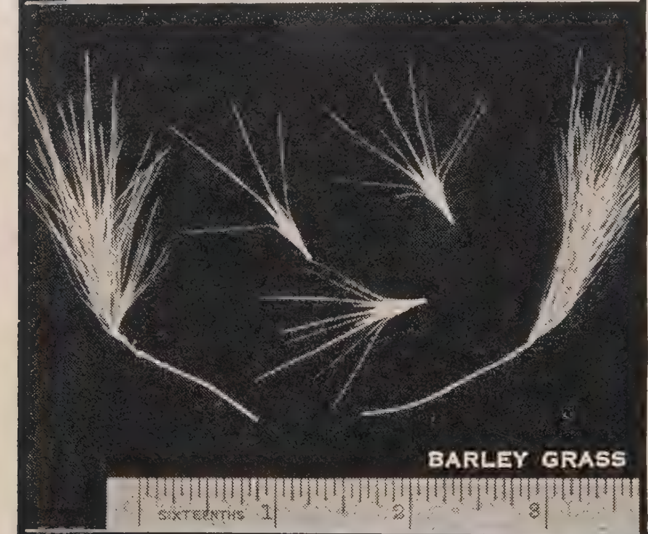
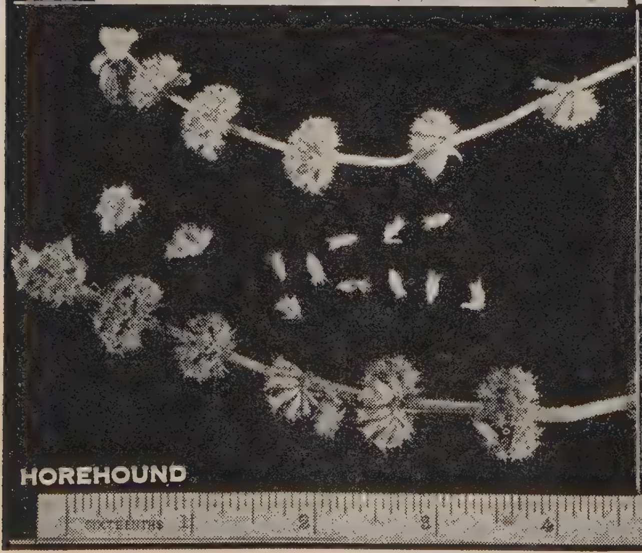

BARLEY GRASS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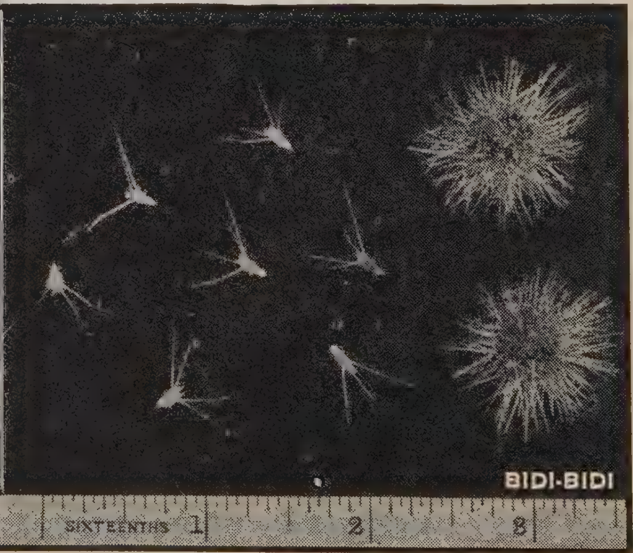
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TO WOOL AND SHEEPSKINS

stems (which are short in some grazed pastures, but may be 2ft. or more long where plants are protected or less palatable than the surrounding pasture), feather-shaped leaves 4in. to 18in. long, and a small purplish flower.

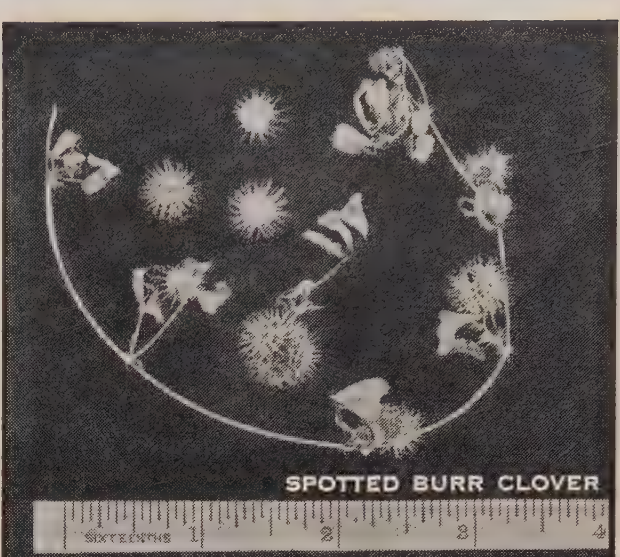
Drought Resistance

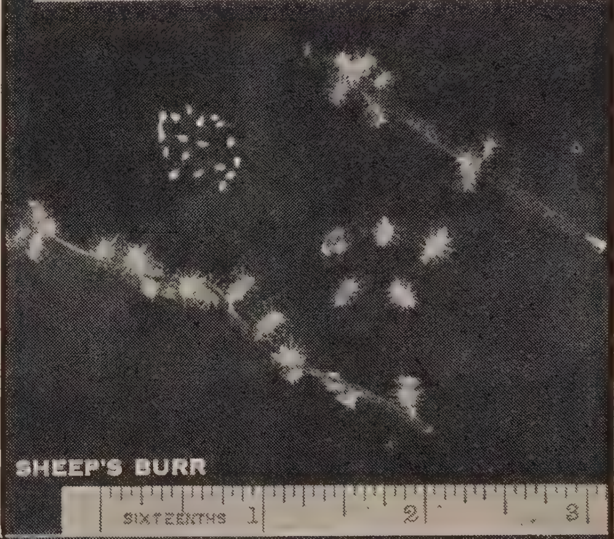
Though often regarded as a weed, *Erodium* is often considered a valuable constituent in pastures on light or dry sandy soils, where it may afford feed after other plants have perished in drought conditions. Because of its drought-resisting ability, *Erodium* is likely to become much more noticeable during seasons when drought conditions open up the sward. Knolls or crests under dry conditions, gateways where tramping has opened up the turf, or open flat pastures after a dry period are places where the entry of the weed may be first noted. Though it has been present for many years, the fact that stork's bill is at present conspicuous in many parts of Hawke's Bay may be attributed to three consecutive dry seasons, and as the plant appears to have thrived and spread in many areas, even to suburban parks and private lawns, it should be closely watched before shearing time. In particular attention is necessary in relation to lambs' wool, because last season wherever stork's bill seed was present in fleeces there was a considerable reduction in prices paid for lambs' wool.

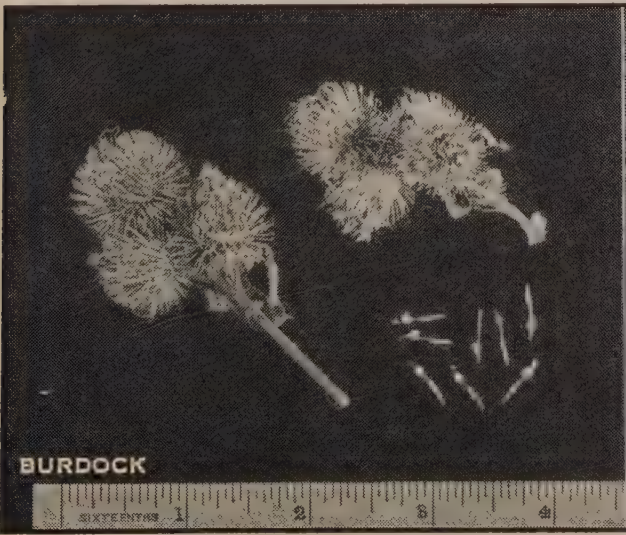
On some properties stork's bill is used for fattening, but on others it appears to be less palatable to stock than the surrounding pasture and is thus left to grow and seed unchecked.

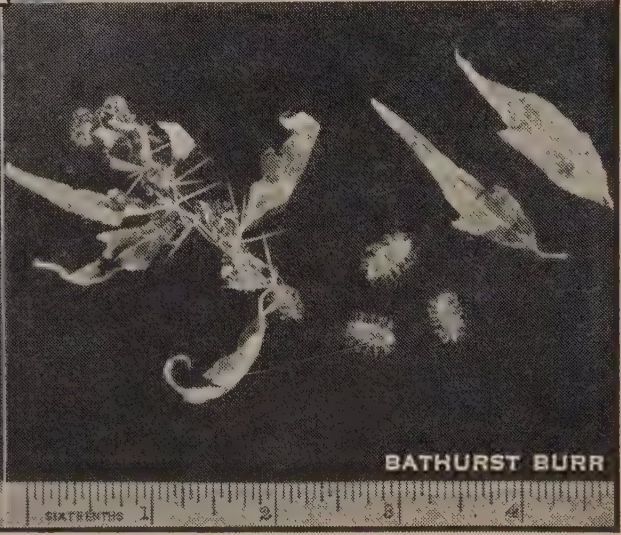
Seed Damage to Wool

A heavy loss in wool values is attributable to the difficulties experienced by the woollen industry in removing *Erodium* seeds from the wool. The spiral awns work their way among the wool fibres and are stated to resist all the usual means employed, other than carbonising, for the removal of vegetable matter. (Carbonising involves treatment of the wool with dilute sulphuric acid and subsequent baking and dusting out of the remaining charcoal). Consequently many prospective buyers do not bid for *Erodium*-infested lines. Lambs' wool is affected most by the seed and where the specification of non-infested wool would be "average" to "good," infested wool would be classified as "inferior" and as a result would be worth, on the past season's market, at least 6d. a pound less, irrespective of the fact that these inferior grades are very much harder to dispose of and are the first lines to be affected by a falling market.

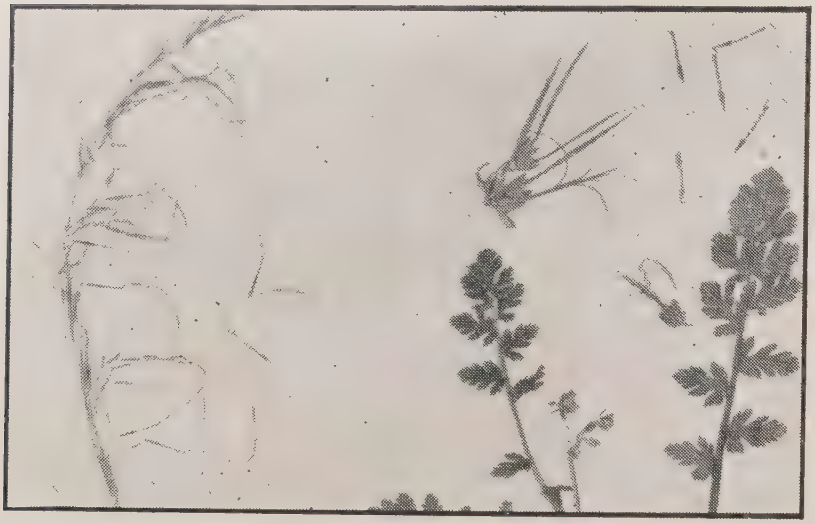

SPOTTED BURR CLOVER


SHEEP'S BURR


BURDOCK


BATHURST BURR

WEEDS AND SEEDS INJURIOUS TO WOOL



Black jack (left) compared with *Erodium* (right). The similarity of the awned seed has often led to *Erodium* being miscalled black jack.

Damage to Pelts

The value of pelts depends very largely on the condition of their grain side—the side on which the wool grows—and while good, clear-grained pelts will process into many kinds of fancy leathers such as glove leathers, etc., faulty-grained pelts have to be used for cheaper basils and linings. *Erodium* seed, with its hygroscopic awn, often screws its way through the wool and the seed itself becomes embedded in the grain of the pelt. Even after the elaborate chemical treatment for removal of the wool and subsequent liming, fleshing, bateing, and curing, a large proportion of seed remains embedded. This breaks the grain and thus ruins the pelt for any of the better grades of leather. On many lamb pelts there are hundreds of seed holes, and though no actual infection or sores might have been apparent on the lambs, the retarding effect of irritation and discomfort to growing animals must have been considerable, for though the seed does not completely penetrate the pelt, as is the case with barley grass, it penetrates the grain and remains embedded between the grain and flesh side of the skin.

Spread Must be Watched

Though the full extent of the trouble caused to the sheep and wool industry by *Erodium* and its seed may not be readily apparent to fat lamb producers, an inspection of affected lambs' wool and damaged sliped pelts from lambs from *Erodium*-infested pastures would be instructive. The growth of *Erodium* no doubt has been assisted and the effect of the seed aggravated as a result of breaking of swards during a succession of dry seasons, but any spread of a weed of this nature must be watched closely. Though the full extent of the damaging effect of this seed to the woollen industry is still a matter of conjecture, wool containing this seed is graded "carbonising" and devalued accordingly.

On much of the Maraekakaho and Tikokino country in Hawke's Bay *Erodium* tends to take charge; it often dominates sowings of better grasses, particularly when the latter have not established well. *Erodium* then takes charge and ultimately fattens the stock.

Whatever virtues *Erodium* may possess must be weighed against its disadvantages and even if the weed does fatten stock in dry periods, allowing it or encouraging it to dominate may prove a very costly business, as with its coiled, spiral awn *Erodium* seeds readily and is easy to pick up and transport.

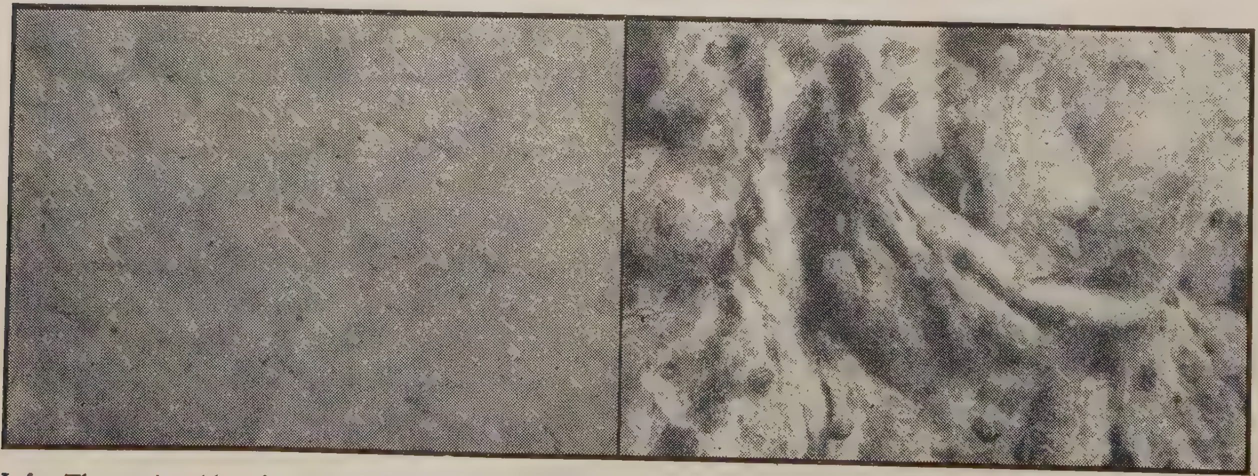
It would appear that on heavily-infested *Erodium* areas the best method of attacking the weed is by sowing of suitable pasture mixtures and by building up the fertility so that an unbroken sward of increasing density is provided.

Barley Grass

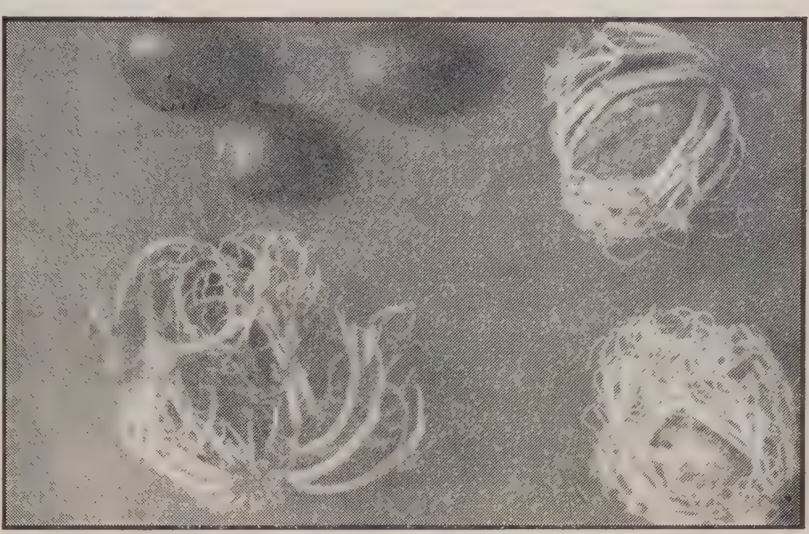
Barley grass (*Hordeum murinum*) is a troublesome annual weed on many farms. Its barbed seed head possesses remarkable penetrating ability which, irrespective of its natural advantages as far as its reproduction is concerned, can be a direct menace to stock and a continual worry to farmers. The seed has long, sharp awns which make it like a barbed spearhead and allow one-way movement only. The sharp projections on the awns act as stops —ratchet fashion—and any movement forces the seed forward. This injurious penetrating ability results in considerable damage to stock and a corresponding loss to farmers each year.

Damage to Pelts and Stock

Barley grass seed punctures can result in severe septic wounds in stock and when sheep graze on infested country the barbed seed becomes attached to the wool and often travels inward, completely penetrating the skin. The seed is considered a menace in freezing works and fellmongeries, as it is responsible for considerable annual loss (both in the returns from



Left—The grain side of a sliped pelt showing embedded *Erodium* seed and damage to pelt quality. Right—Subterranean clover seed in half-bred belly wool.



Subterranean clover burrs removed from belly wool. Note the entangled wool fibres. One husk is unravelled and its seeds exposed.

skins and of material available for processing), since many pelts are badly scarred, pock marked, or punctured by it, and any blemish or injury to the grain side of a pelt prevents its use for high-class leathers.

The amount of damage done to pelts is seldom fully appreciated by farmers and a visit to a freezing works when stock from barley grass-infested country are being killed will prove illuminating. The damage to pelts is incidental to continual irritation, which must check fattening stock.

Eye, ear, mouth, and foot troubles must be guarded against when stock are in contact with barley grass, because if they pick up the seed from pasture or hay and it enters one of the parts mentioned, it can cause a troublesome or serious septic sore. Seed penetrating the gum between the teeth can cause teeth to drop out. Dogs working on barley grass country are particularly susceptible to foot injury, because the seed may become embedded between the toes and work up into the foot or leg muscles.

Barley grass, which is fairly-widely distributed, thrives on broken turf, wherever animals camp, and in old, thin pastures. Apart from ploughing to eradicate barley grass it is advisable to cut the grass before the seed matures and to heap it up and burn it to prevent seed from spreading. Barley grass must be heaped before burning, as it is necessary to develop considerable heat to destroy the seed. If the cut grass is burnt where it falls, the seed is often merely singed, which fails to prevent germination.

A smaller species of barley grass (*Hordeum marinum*) is often found on coastal pastures, but because it is less conspicuous it should not be overlooked.

Barren Brome

Barren brome (*Bromus sterilis*) can be even more troublesome than barley grass, as the awns are often longer and harder and have serrated edges. The weed, which appears to be worthless, grows on roadsides, river-beds, camp sites, and sandy pastures. It is an annual which has a drooping seed head, leaves covered with long hairs, and a seed cluster that is purple at the base.

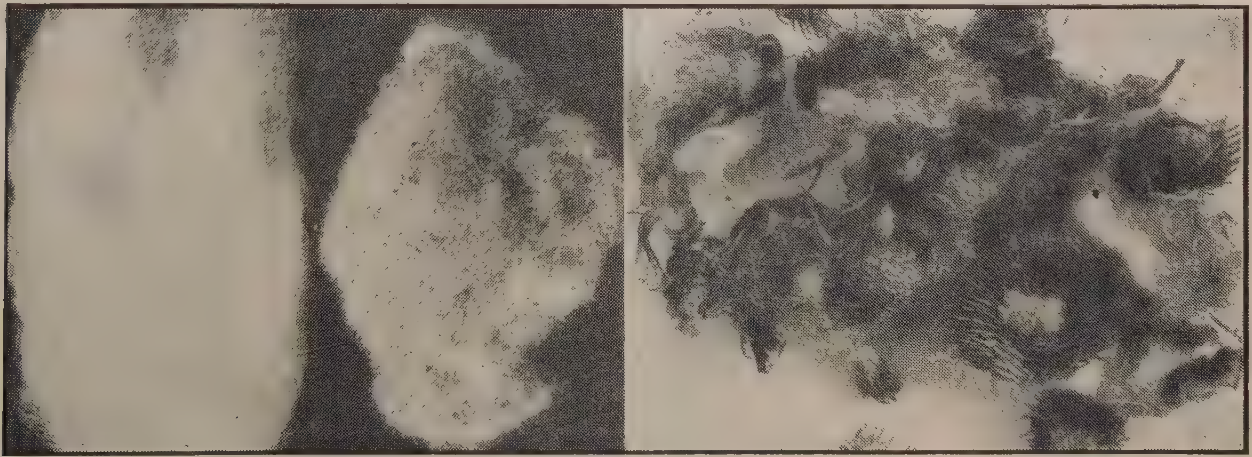
Burr Clover

Burr clover (*Medicago hispida*) is responsible for considerable annual loss both to wool growers and wool manufacturers. The hooked burrs of the clover become entangled in the wool of grazing and resting sheep and are very difficult to remove from the shorn fleeces and pieces. It is not the seed which damages the wool, but the hooked and spiralled seed pod. This coiled pod unwinds during wool processing, and as it is fibrous it can pass through the carding machines and thus mar the finished woollen product. Wool containing burr clover seed must always be classed separately. It is better to leave a seedy fleece unskirted than to skirt it and to include burry pieces with good, free pieces. Wools contaminated by burr clover usually require carbonising, a process which involves extra labour, added cost, and greater risk.

Burr clover, the leaf of which is trifoliate, is about the same size as that of white clover, but the flowers are yellow and may be single or in clusters of up to five. On much of the fattening land in the warmer districts burr clover, which is an annual, often merely crowds out more valuable pasture plants.

Spotted Burr Clover

Spotted burr clover (*Medicago arabica*) is sometimes called spotted medick. It is very like burr clover except that the leaflets have a large, black central spot. As with any other burry wool, fleeces infested with



Left—Part of a wool sliver removed when half way through a carding machine (left) and discard from the same sliver (right) showing dirt, vegetable matter, kemps, etc. Right—Thistle flower heads removed at a woollen mill. Down from the flower centre can mix with the wool fibres and, being vegetable matter, will not dye evenly with the wool. Prickles and fibrous casing add to processing difficulties.

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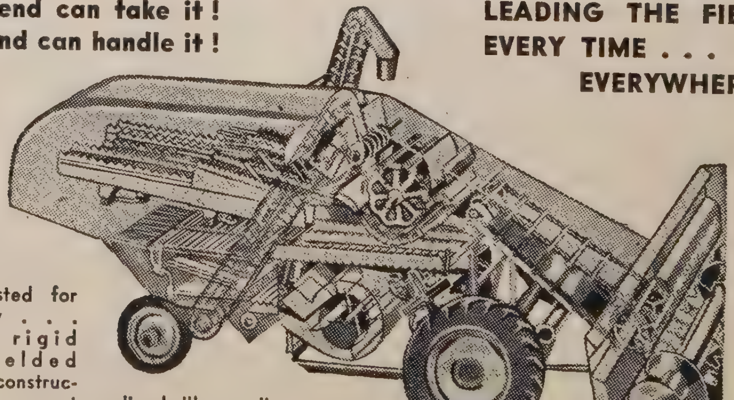

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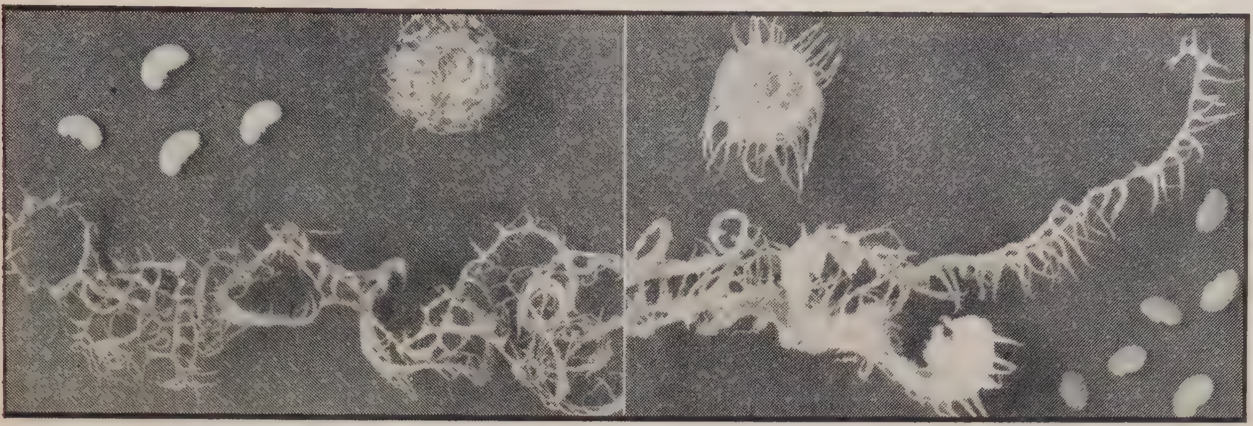


Left—Burr clover as removed from a fleece and showing the wool fibres entangled. One burr has been unravelled to show the tough, hooked fibre which when torn open in the wool-processing machinery may pass through with the wool fibres and mar many yards of finished cloth. Right—Spotted burr clover showing one burr unravelled and seeds exposed.

Medicago arabica must be separated at classing, unless the whole clip is affected. If many burrs are seen, it is logical to conclude that many more are embedded in the wool and the whole clip will usually be graded for burr. Under no circumstances must the grower risk any burr being found in supposedly-free wool.

Piri piri

Piri piri (*Acaena sanguisorbae*), commonly called bidi-bidi, hutiwai, or utiwai, is a well-known native plant very common on bush-burn country. The seed ripens in a spiked ball, which in size may range from that of a shilling piece to a half-crown. The individual spikes have minute, barbed bristles which, combined with the easily-disintegrated ripe seed head, make it a real nuisance to woolly sheep and lambs.

Many back-country farmers are forced to shear their flocks (including lambs) early solely because piri piri seed can convert a complete fleece into a hard, solid mat of wool and seed. The fine, hooked awns create another problem for the woollen industry, as some may pass through the processing machinery in the woollen mills, producing defects in finished materials. Wools containing piri piri seed must always be classed separately, for though carding machines may take light seed, any heavily-infested wool must be carbonised, and is graded accordingly.

Piri piri is usually unpalatable to stock and appears to withstand grazing by sheep, but where topdressing is done and sufficient cattle are carried the weed can be checked or eradicated. Piri piri spreads by prostrate, spreading stems which creep through pastures closely grazed or overgrazed by sheep. On topdressed and spelled country the growth of grass lifts the runners off the ground and heavy stocking with cattle is then beneficial, particularly where efficient subdivision can be done. Shearing before burrs are ripe reduces the extent of wool contamination.

Barren brome, which has coarser and longer barbed awns than barley grass. The plant may often be found growing in profusion on river and beach shingle country.

Bathurst Burr

Bathurst burr (*Xanthium spinosum*) is a shrub-like plant from 9in. to 5ft. high, which favours waste areas about sheepyards, woolsheds, and river-beds, and neglected corners on good land. The under-side of the leaf and the stem are whitish, the stem being studded—in groups of three at each joint—with needle-like spines often 1in. long. The seed, which grows on the stems at the base of the leaves, is a hard oval burr thickly studded with hooked prickles. It is very easily picked up and becomes firmly embedded in the wool. In the hardness of Bathurst burr seed lies the principal danger, because it may damage manufacturing machinery in the woollen mills. Any wool containing the seed—usually occasional fleeces only—must be kept out when classing is being done, or the price for a whole clip may be affected.

Sheep's Burr

Sheep's burr (*Acaena ovina*), which was introduced from Australia, has foliage similar to piri piri, but the seeds are in small, round, hooked burrs along the stems, which are often 2ft. long. The stems have a reddish-purple tint. The space between the hooked seed pods diminishes toward the stem tips, where the burrs are clustered. Where sheep are running on an area heavily infested with sheep's burr the whole of the wool clip may have to be classed as burry. It is more usual, however, for only a few fleeces to be affected, but these must be kept separate in skirting or classing.

Burdock

Burdock (*Arctium lappa* and *A. minus*) is a strong, shrub-like plant sometimes found about river-beds, sheepyards, woolsheds, or places where sheep cleanings or dags have been dumped. The plant may be from 2 to 4ft. high and has a purple, thistle-like flower with a sheath of sharp, hooked spines. It is the sheath, which may be so sharply hooked that it will attach itself to bare skin, that becomes entangled in the wool.

Subterranean Clover

Subterranean clover (*Trifolium subterraneum*) is a very useful plant which has been the means of raising carrying capacity on many fertile, low-rainfall areas and on light soils of low natural fertility. The seed is contained in a hooked pod which can become embedded in the wool. The important point from the wool grower's point of view is that heavy contamination with subterranean clover seed—the plant often seeds during the busy shearing period—may cause wool to be classed as burred. Where a whole clip is affected not much can be done, but where seed shows in isolated fleeces only, they should be kept apart at skirting and classing, particularly where some bellies are affected.

An *Erodium*-dominant pasture with tufts of ryegrass showing through.

Thistles

Though not generally classed as seed or burr, Scotch, winged, star, Californian, nodding, and variegated thistles have a flower head which can be a distinct nuisance to the woollen manufacturer, as, if unnoticed at sorting, it will break up in the carding machine. The fibrous-casing particles may strip down to show fibres in a finished cloth and the downy centre may become mixed with the wool where, though hard to detect in natural-coloured wool, it will become very obvious in dyed cloth, because the vegetable matter does not take the dye as does wool. Heavy thistle contamination of fleece or piece wool may cause it to be graded "carbonising" and for that reason it is wise to separate any affected fleeces at skirting time.

Blackberry, Brier, Horehound, Gorse

Blackberry, brier, horehound, and gorse particles should be removed from the wool in the woolshed at shearing time, or the fleece containing these particles should be kept separate. Fine particles of sticks, bark, or thorns which may pass through a carding machine can give endless trouble at woollen mills by causing threads to break in the early part of processing. The particles cause obstructions when the thread is passed through the shuttle and considerable time and labour are wasted while machines are held idle to repair broken threads.

Bathurst burr growing on a creek bank adjoining a woolshed.

Bracken, Fern, Manuka

Particles of bracken, fern, manuka, or other leaves often become thickly embedded in fleeces from rougher country, back wool being particularly affected. These fleeces should also be graded separately to prevent their affecting the value of the free fleeces.

Loss to Wool Growers

Burrs, seeds, and vegetable matter cause serious trouble in the woollen industry and can affect growers' returns materially, especially today when there is such a shortage of manufacturing machinery. Naturally, under these conditions, the manufacturer wants raw materials which will give the largest output with the least strain on equipment, and only wool free from vegetable impurity can give that result. To obtain free wool the buyer is willing to pay a premium, with the result that faulty grades are neglected and prices fall accordingly.

Maximum Weights for Bales of Wool

A BALE of slipe, lamb, carbonised, scoured, or fleece wool, packed separately or with any other wool, must not exceed 400lb. in weight; a bale of bellies, crutchings, locks, pieces, and other oddments, packed separately or together, must not exceed 450lb. That is the effect of the Board of Trade (Wool-packing) Regulations, 1948, which came into operation on November 18.

It is now an offence to pack for sale or transport, to consign, deliver, or transport, or to cause to be consigned, delivered, or transported a bale of wool which exceeds the maximum prescribed by more than 2½ per cent., but wool packed before the regulations came into effect is exempted.

BRUSSELS SPROUTS A VALUABLE WINTER CROP IN OTAGO

By W. G. CRAWFORD, Instructor in Vegetable Culture,
Department of Agriculture, Dunedin.

LITTLE is known of the origin of brussels sprouts, but according to literature the vegetable was in demand as a food in Brussels as early as 1213, and its name is derived from association with the Belgian capital. In Otago the history of brussels sprouts culture dates back to 1890. Although there are no reliable records available, it is highly probable that brussels sprouts were included among the first vegetable crops grown, but not until recent years was this most important crop cultivated in Otago on a commercial scale. Today Otago is the leading brussels sprouts-producing area in New Zealand. Production is confined mainly to Taieri and Oamaru districts, where some 70 acres, with a yield of approximately 350 tons, are grown annually.

A well-developed plant partly harvested.

THE value of the brussels sprouts crop to Otago market gardeners varies considerably each year according to market fluctuations, but the return for the last crop was estimated at between £16,000 and £20,000.

The distribution of the crop is determined mainly by market prices, but the following list gives some idea of the way in which Otago-grown brussels sprouts are distributed:—

Market	Percentage of crop
Invercargill	6
Gore	2½
Balclutha	1½
Dunedin	35
Oamaru	2
Timaru	4
Christchurch	35
North Island cities	14*

* When transport is normal.

Brussels sprouts rank high in importance among the vegetable crops grown in Otago and every care is taken to maintain a high standard of cultural practice and to bring production to the highest possible level.

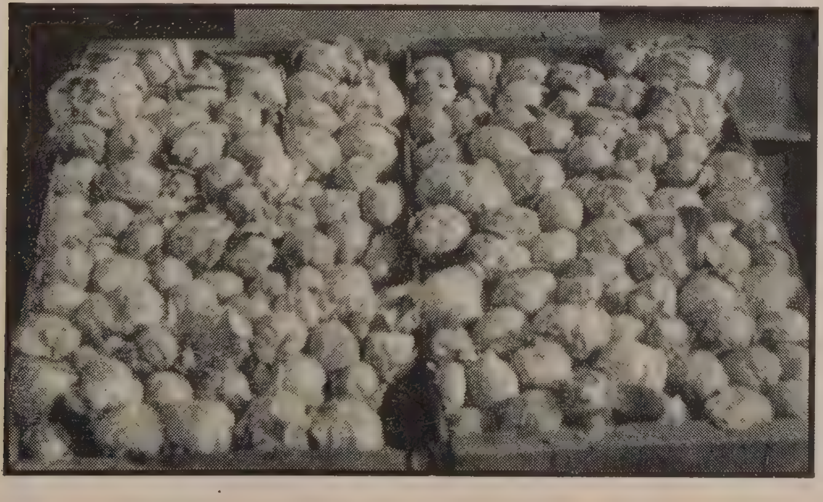
Otago's climate and soil conditions seem well suited to the cultivation of brussels sprouts. As with most crops brussels sprouts will naturally do much better on certain classes of soil than on others, and in Otago the most suitable soils are those ranging from loam to heavy loam. Very light sandy soils and shallow soils should be avoided.

In the Otago district land must be well drained, either naturally or artificially, free working, of a good depth, and in proper physical condition to produce good crops of high quality. Excellent crops are obtained during the first two or three years where virgin land rich in organic material (grass and rootlets) has been opened up. The organic material assists in keeping the soil open during the growing season, in conserving moisture, and ultimately in supplying plant foods. In older land these conditions are attained only through the addition of organic matter to the soil by working in green crops, etc. As brussels sprouts are gross feeders, ample plant food and moisture are needed.

Exceptionally high yields have been obtained in Otago in seasons when the autumn has been wet and cold, but the winter comparatively dry.

Fertilisers

In fertile virgin soils the plant foods necessary for successful cropping are generally present in sufficient quantity, but elsewhere it may be necessary to apply fertilisers and organic manures. This may be done either by adding artificial fertiliser or by incorporating green crops or animal manure with the soil.



Brussels sprouts packed in cases ready for market.

Many methods are adopted for increasing yields: Good cultural practices, disease control, and seed selection all have their bearing on crop production, but Otago growers consider that the intelligent use of fertilisers on ordinary soils is a most important factor in the economic production of brussels sprouts.

Because most market gardeners find it difficult, if not impossible, to obtain natural manure such as stable manure, stack bottom, cow byre cleanings, etc., artificial fertilisers have to be used. It is not possible to lay down any hard and fast rule as to what manures to apply, as the type and quantity required depend generally on the previous crops grown on the land. There are, however, certain basic principles practised by Otago growers, who realise that fertilisers improve the quality of the crop considerably and greatly influence the yield.

Best results over a number of years have been obtained by using a mixture of superphosphate, 3 parts by weight, blood and bone, 4 parts, and sulphate of ammonia, 1 part. This mixture is used, at the rate of 8cwt. to the acre, by growers throughout Otago with excellent results. It is applied in two dressings: The first at the rate of 6cwt. to the acre is made before transplanting the crop; the second, at the rate of 2cwt. to the acre, is made as a top-dressing, generally 2 months later, just before inter-row cultivation begins.

BRUSSELS SPROUTS CROP IN OTAGO

Land ridged ready for planting.

Green Manure and Stable Manure

Stable and animal manure, usually combined with straw, has been found excellent material for incorporation with the soil for brussels sprouts growing. However, the value of the manure to the crop depends largely on the kind of animal from which the manure was obtained and the percentage of straw incorporated with the manure. Stable manure is broadcast on the land after the initial cultivation and lightly harrowed in before ridging is done.

Green-manure crops are most important for improving the physical condition of the soil, which is necessary for free development of plant roots and high-producing crops. Only by the incorporation of organic material has it been possible to prevent the physical condition of the soil from being impaired. There are several crops suitable for employment as green crops, but in Otago those used, in order of importance, include oats, lupins, barley, and peas. There are many important factors to be taken into consideration when determining the most suitable green crop to grow, but generally the value of a green crop lies chiefly in the quickness of growth and the amount of humus produced per acre. Deep-rooting green crops bring plant food from the subsoil and when incorporated into the topsoil provide additional plant foods for the growing crop.

Where the land is inclined to cake, two green crops can be grown in the ground during the spring and summer. If a system of crop rotation and green manuring is followed, the physical condition of the soil can be maintained.

Preparation of Land

Because of variations in the soil and the varying treatment necessary on different classes of land, there is no set method of cultivation, but the aim is to bring the soil to a fine tilth suitable for the needs of the crop and for the free development of the plant roots. No crop responds better to good cultural conditions of the soil than do brussels sprouts.

The initial cultivation before planting is a most important factor in successful cropping. Deep cultivation is carried out as early as possible in the spring as soon as soil conditions are favourable. The soil is usually cultivated to a depth of 8 or 9in., but this will depend on the depth of the soil. The ground is worked to a fine tilth and a green crop sown for incorporation in the soil to increase the supply of humus.

Growers have found that brussels sprouts thrive best on virgin soils rich in organic matter, which clearly indicates that humus in some form is necessary. It is therefore obvious that for good crops the condition of the soil should be as similar as possible to that of virgin soil. The green crop should be evenly distributed throughout the soil rather than ploughed in in the ordinary way, and the rotary hoe has given excellent results in Otago market-gardening districts, where the subsoil is mainly sandy.

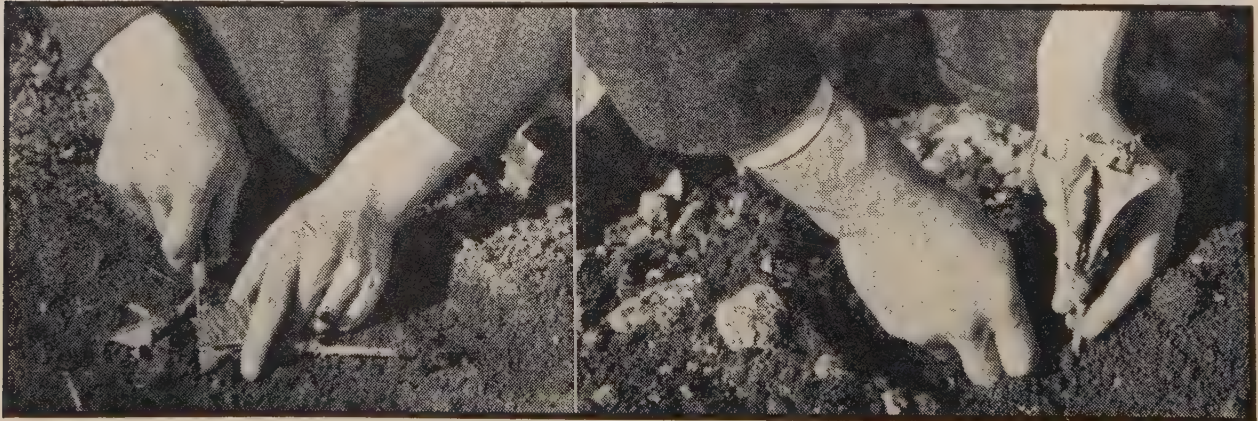
After the green crop has been hoed in the land is generally allowed to lie until 2 weeks before planting, when it is given a further cultivation with the discs and spring-tooth cultivator. After being worked to a fine tilth the soil is thrown up in ridges 2ft. 6in. apart and 8 to 9in. high, running in the direction of the water flow. Ridging facilitates drainage and makes for a longer growing season, as the soil is kept much warmer in the autumn and early winter than where the soil surface is flat.

Liming

In Otago liming before initial cultivation is an important part of management where brussels sprouts or any other cruciferous crop is being grown and is seldom neglected by the more experienced growers. Liming, which is usually carried out at 2- to 3-year intervals, assists greatly in the prevention of club root, a common disease of brussels sprouts and allied crops. The rate of application is from 20 to 30cwt. of carbonate of lime per acre.

Varieties

Of all the varieties of brussels sprouts cultivated commercially in Otago Scrymger's Giant has met with the most success if given suitable treatment.



Left—Removing part of the leaf growth before planting. Right—Soil being pressed firmly round the roots.

Plants growing on ridges running in the direction of the water flow.

Raising Plants

Late October or early November is considered the best time to sow brussels sprouts in Otago to produce well-established plants ready for planting out in late December. The more thorough the cultivation of the land on which plants are to be raised the better plants are likely to be. As plants from poorly-prepared seed-beds seldom yield good crops, great care must be taken in the preparation of the ground. Plants do best when sown in beds raised 6 to 8in. above the level of the surrounding land. To provide favourable conditions for the seed the soil is reduced to a very fine tilth. Where the land has been used previously for gardening a dressing of blood and bone and superphosphate is applied at the rate of 6oz. per square yard and lightly hoed into the topsoil. A topdressing of lime, ¼lb. per square yard, also helps to keep the soil in good condition and assists in the production of healthy, vigorous, stocky plants.

The seed should be sown thinly and evenly in rows 6in. apart, running north and south. Beds 4ft. wide are considered the most convenient for working, as the operator can weed any part of the bed without tramping on the bed itself. Successive sowings of seed are made when required up to mid-December. Plants are never allowed to remain in the seed-beds until they become root bound or are checked.

Planting Out

In Otago the planting of the crop extends over a period of 6 to 8 weeks. However, most of the planting is done from mid-December to mid-January, which is considered the best time for starting plants successfully.

Only plants free from disease, with good root formation, and of strong, vigorous appearance are planted out. Care is taken to see that the crown or heart of the plant is not damaged in any way during handling. Transplanting is all done by hand in Otago and where two or more operators are engaged a small garden spade has been found to be the quickest and most satisfactory implement for the work. On one-man units an ordinary garden trowel is quite satisfactory. Correct spacing of plants is important, because brussels sprouts require plenty of room for full development. It is usual to allow 2ft. between plants, with 2ft. 6in. between rows. At this spacing approximately 9000 plants are required to plant an acre.

Plants should be thoroughly watered in the seed-bed several hours before planting in the field. It is preferable to transplant on a cool day, to avoid excessive wilting. Plants are placed in the soil opening prepared either by a trowel or a spade and the soil filled in and pressed firmly around the plant without crushing or disturbing the roots in the ball of soil attached. If this work is carried out when the soil is dry, a good watering to settle the soil round the plants is beneficial. During dry weather the top half of the leaf growth on each outside leaf is removed with a sharp knife to form a balanced condition with the root system, which may be injured during transplanting.

Management of Growing Crop

Frequent shallow cultivation to keep the soil loose and weeds in check is practised, but deep cultivation, which is likely to disturb the roots of the plants, should be avoided.

Brussels sprouts are perhaps the best of all winter vegetables cultivated in Otago, but are by no means an easy crop to grow. The plants must be given the proper cultural conditions. That is, they must have a uniform moisture supply, there must be adequate available plant food, and they must not receive any check in growth, particularly during the early growing period. Close, firm sprouts are required, and if the crop is grown in dry soil during hot seasons, the atmosphere tends to make the sprouts open. The number of cultivations necessary depends on weather conditions and the physical condition of the soil, but cultivation should not extend into the early, wet winter months. The surface soil is kept sufficiently loose to absorb and retain moisture and permit free root action and extension in search of food.

Removing the lower leaves.

The second application of fertiliser, mentioned earlier, is applied by hand close to the plants, 6 to 8 weeks after planting, just before cultivation begins.

A practice strongly advocated by growers is the use of the hoe as soon after rain as possible at every opportunity during the summer. The object is to restore the tilth of the land and to conserve moisture.

Sprouts form on the stems in the axils of the leaves and these leaves should be removed as the sprouts appear. All bottom and decayed leaves should be removed in late autumn so that light and air can reach the plants. The usual procedure is to break the leaves off short by bending them down sharply. The stump of leaf stalk usually left withers and falls, leaving a healed scar.

Harvesting

The harvesting of the crop extends over a considerable portion of the year. In the Oamaru district harvesting commences usually in May. Owing to its proximity to the sea, the climate of the district is more favourable for the earlier development of the sprouts than that of the Taieri district, where harvesting generally begins 2 to 3 weeks later. Harvesting continues right through the season, from May to September and even later in some seasons. Harvesting should not be delayed unduly, but in certain soils, particularly the sandy, well-drained loam of the Taieri Plains, the sprouts remain in excellent condition for longer periods than in the Oamaru district, where the climate is usually warmer. As the harvesting of the crop proceeds additional bottom leaves are removed, but those forming on top of the plant are retained, because they are necessary for the well-being of the plant and they also provide protection from frost for young sprouts.

The earliest-harvested crops generally command high prices on the local market and are seldom sent out of the Otago Province in any quantity during the months of May and June, when it is the practice to harvest sprouts and pack them in 25lb. cases for sale. Cases reduce to a minimum the risk of bruising and at the same time allow for good ventilation between the time of harvesting and retail distribution. Crops harvested later are packed in both cental bags and cases. Packing in bags is done mostly for the sake of convenience when produce is to be railed to markets outside the Otago district. Sprouts packed in cases keep better for a longer period than those packed in bags, which sweat badly if held for any length of time.

Pests and Diseases

Information on insect pests and diseases attacking market garden crops is available from all branches of the Horticulture Division, Department of Agriculture, and consequently only those experienced each year in Otago are mentioned here. Generally brussels sprouts in Otago are affected by few diseases and insect pests other than club root, cabbage aphis, and white butterfly, which seriously affect crop yields.

There is not very much spraying of brussels sprouts done in Otago, but the information given below on the principal diseases should be of assistance to those desirous of carrying out a spraying programme. For successful cropping in Otago there are several important points which must be kept in mind when dealing with all pests and diseases: Spraying must be done at the correct time; it must be thorough; and good judgment must be used.

Starting at the base—the correct method of harvesting.

Disease Control

Club root (*Plasmodiophora brassicae*): This fungus disease attacks all cultivated plants of the cabbage family, causing swellings and knots of varying sizes and shapes to develop on the roots. The plants become yellowish, stunted, and make very little growth. Spores of this fungus enter the plant through the root cells and feed on the contents. When the root dies spores are set free in the soil to attack plants of the same family when conditions are favourable. The spores are small, move easily in the soil water, and may cause serious losses if certain preventive measures are not adopted, and the following are recommended:—

1. As the disease flourishes in acid conditions, sweeten the soil for brussels sprouts growing by applying lime at 2- to 3-year intervals at the rate of 1 to 3 tons per acre; improve drainage where this is not satisfactory.

2. Practise crop rotation as far as possible by allowing as long an interval as practicable between the growing of host plants. Exclude cruciferous crops from affected land for a period of at least 3 years.

3. Examine all plants carefully when lifting them from the seed-bed and destroy any showing club root infection. Treat infected seed-bed soil with mercuric chloride.

4. Destroy all infected plants by burning.

White butterfly (*Pieris rapae*): The caterpillar of this butterfly feeds on the leaves of brussels sprouts and related plants. The caterpillar, which may be up to 1¼in. long, is dull velvety-green with an orange stripe down the middle of the back. The pest is worse in hot, dry seasons and over the past few years has been troublesome to growers, resulting in heavy losses of produce.

To control the pest plants should be sprayed with arsenate of lead (1½lb. to 100 gallons of water). Spray the under-sides of the leaves thoroughly.

Cabbage aphis (*Brevicoryne brassicae*): The cabbage aphis or the green fly, as it is generally called, does considerable damage to all cruciferous crops in Otago if unchecked. The pest is particularly troublesome in periods of dry weather, when colonies of the small, greyish-green insect cause leaves of the plants to curl, giving a greyish appearance to infected plants.

To control the aphis plants should be sprayed with nicotine sulphate (1 part to 800 parts of water, plus 3 to 4lb. of soft soap to every 100 gallons of solution).

◆

CASEOUS LYMPHADENITIS ERADICATED

By Aseptic Conditions in a High-country Shed

THE eradication of caseous lymphadenitis by the adoption of strictly aseptic conditions in the shearing shed has been achieved on the Godley Peaks Station in the Mackenzie Country. Several years ago the station was putting between 1000 and 1200 Merino sheep through the works annually and an average of between 25 and 33 per cent. was being rejected because of lymphadenitis. In the past 2 years, with about the same number of sheep being sent to the works, there have been no rejections because of lymphadenitis.

THIS outstanding success is attributed by Mr. John Scott, owner of the station, to the following:—

1. Olive oil with a 5 per cent. carbolic added for use on the sharpening stones is supplied to shearers.

2. Oil rags consisting of scoured sheepskins, which are changed twice weekly, are supplied to the shearers.

3. Water tins contain a strong solution of carbolic soap.

4. The shearing board is scrubbed down with an antiseptic solution after each day's operations, even if only a few sheep have been handled in that day.

5. The concrete floors of the counting-out pens are sprayed at regular intervals to keep down dust, and after each day's shearing the pens are thoroughly hosed down.

—*K. G. GRAY, Inspector of Stock,*
Department of Agriculture, Fairlie.

Illegal Wool-branding Materials Still Being Used

MOST farmers are aware that wool-branding materials must be tested and approved by the Department of Agriculture before they can be marketed. It is now a punishable offence to use anything other than approved wool-marking preparations, or to add anything to an approved preparation which will make it harmful to the wool.

This legislation is in the wool growers' own interests, because brands which will not scour out cause enormous damage and loss in the woollen mills—and in the final analysis this loss has to be borne by the grower of the wool. From complaints still being received from buyers and mills, some farmers apparently are still using harmful materials, so buyers continue to view all brands with suspicion. Thus the majority of wool growers are suffering for the actions of the few.

The remedy lies in the producers' own hands—the use of only approved branding materials.

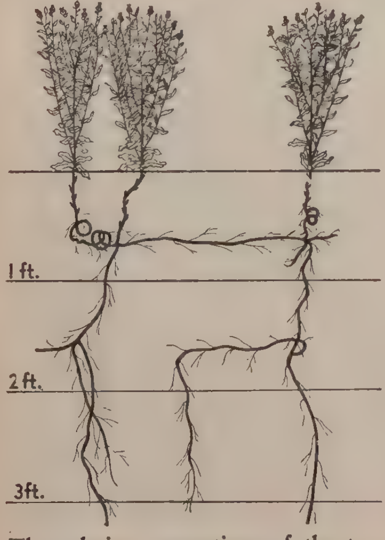
Russian Knapweed, a Potentially-serious Weed of Cultivated Land

THE recognition of a small patch of Russian knapweed *(Centaurea repens)* in the vicinity of Blenheim early this year shows that another potentially-dangerous weed has become established in New Zealand. The patch, which is now about ⅛ acre in area, has been on this property for longer than 12 years and fortunately has not spread greatly, but that is probably the result of the treatment it has had and its environment, for under suitable soil conditions Russian knapweed would be likely to become a very serious weed on cultivated land in New Zealand. J. P. Beggs, Instructor in Agriculture, Department of Agriculture, Blenheim, describes the weed and the methods used in other countries in attempting to eradicate it.

THE patch of the weed at Blenheim is on a clay loam which is often waterlogged in winter and very dry and hard in summer. Fortunately such conditions have not favoured rapid spread of the plant's vast underground root system. The fact that the paddock has been in pasture for most of the period since its appearance has also had an important effect on its failure to spread to any great extent. The leafage is eaten by stock, so that under grazing little is noticed of the weed and it has no great opportunity of extending and building up reserves in its root system.

How the knapweed was introduced into New Zealand is not certain, but it is significant that it was first noticed in a lucerne stand, and, as it has been most commonly introduced into other countries in lucerne seed, it is possible that it came here in this manner.

The following closely-related plants are already well established in various parts of the country, but nowhere have they become a menace: Knapweed (*Centaurea nigra*), star thistle (*Centaurea calcitrapa*), yellow star thistle (*Centaurea solstitialis*), and Malta thistle (*Centaurea melitensis*).



The relative proportions of the top and root of Russian knapweed. The vertical roots descend 6ft. or more.

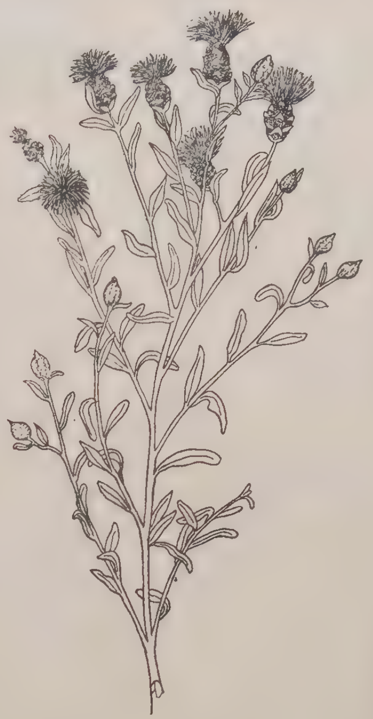
Description of Plant

Russian knapweed is a perennial which becomes very persistent and difficult to eradicate because of its extensive underground root system. At different stages of growth the aerial parts of the plant present markedly-different appearances. The young shoots take the form of a rosette with leaves about 3in. long and more or less notched. They present a greyish-green appearance because of a white down or nap which clothes them. The mature plant has narrow leaves 1 to 2in. long, with an even margin. These leaves are smooth, with no pronounced midrib or stalk.

The plant is a type of thistle, but bears no thorns or prickles, and the much-branched seed head resembles that of other thistles. The flowers are lilac coloured and the thistle-like seeds bear a tuft of hairs at one end, very much like the star thistle seed. The stems of the mature plant, which are about 2ft. high, are woody and tough, being inedible when dried out. However, stock will graze fresh growth quite readily.

The stems extend into the ground to a depth of 6 to 8in., where they join a vast horizontal root system which spreads out in net-like fashion. From this horizontal system vertical roots descend at frequent intervals to a depth of 6ft. or more. The roots and lower stems are covered with a brown to black skin.

This extensive root system provides a capacious storehouse for plant foods, so that the plant is persistent under continued cultivation. It also allows the knapweed to make very rapid growth in spring, with the result that few plants can withstand its smothering effect.



Typical leaves, flowers, and aerial stems of Russian knapweed.

Occurrence in Other Countries

Russian knapweed originated in the Caspian region of southern Russia. It is a notorious impurity in lucerne seed from Turkestan, and apparently found its way to the United States of America as such an impurity, for it was first recorded there in a lucerne paddock in 1930. Ten years later it was recorded in all the western and central States. It is also present in Canada, and was recorded in Australia in 1930. In the U.S.A. it is a serious weed in cereal crops, and in Australia it is troublesome in Murray River vineyards.

In all these countries Russian knapweed is regarded as a very serious weed and is responsible for heavy losses in production. In Australia vigorous efforts are being made to eradicate it before the infestation becomes very heavy.

Methods of Control

The extensive underground root system of the plant causes it to be extremely persistent in the face of prolonged cultivation. Overseas experience has indicated that cultivation at fortnightly intervals for two years or longer is necessary to eradicate the weed. The farmer who undertakes a programme of cultivation to eradicate Russian knapweed is faced with a formidable task. Should weather or other conditions upset faithful adherence to the cultivation schedule, the weed will be allowed to return further food supplies to the roots and the cultivation period will have to be correspondingly extended.

The use of hormone weedkillers has not been successful in other countries, and the weed is reported to be resistant to control in this way.

RUSSIAN KNAPWEED . . .

The main line of attack on small patches of Russian knapweed in America has been the use of weed-killers such as sodium chlorate and acid arsenical sprays. Heavy applications of these (for example, 60 to 90lb. of sodium chlorate a square chain) are reported to give satisfactory control, but this method of eradication is applicable only to small areas.

The building of a bank round a patch of the weed followed by flooding with water for a period of up to eight weeks has also been mentioned as a method of destroying Russian knapweed, but that method has obvious limitations.

Therefore it is apparent that Russian knapweed is a very difficult weed to eradicate, and all known successful methods of control are very expensive to apply.

Importance of Early Recognition

Early recognition of all weeds is the main step in their control, and that is particularly true in the case of Russian knapweed. Had nassella tussock been identified within a few years of its introduction into New Zealand, and had its potential danger been recognised, its eradication would have been simple, but now it presents a difficult problem. It is of the utmost importance that farmers become familiar with all plants growing on their farms and with their potential worth or danger, for should a new and serious weed appear it is extremely important that immediate steps be taken to eradicate it before it has become widely established.

Fortunately the eradication of Russian knapweed at Blenheim should present no serious difficulties, but a careful watch must be kept for its reappearance.

Control Measures in New Zealand

The farmer on whose property the knapweed is present has fenced the area with the intention of keeping it grazed continually. As the plant is comparatively palatable, that will assist in reducing its chances of spreading. In addition, a trial of various kinds of chemical weedkillers has been laid down. As the plant is strong growing and twitch-like, conclusive results are unlikely to be secured with one application. In the meantime the farmer has treated the area with sodium chlorate in the hope that this may check the knapweed.

It appears that this knapweed infestation came to New Zealand in lucerne seed, but the sale of lucerne and other seeds containing Russian knapweed is prohibited in Victoria and possibly other States of Australia. That reduces to a minimum the chance of seed of this weed being brought into this country from Australia, and the amount of lucerne seed coming in from other countries is now negligible.

Illustrations taken from Bulletin 292, Agricultural Experiment Station, North Dakota Agricultural College, U.S.A.

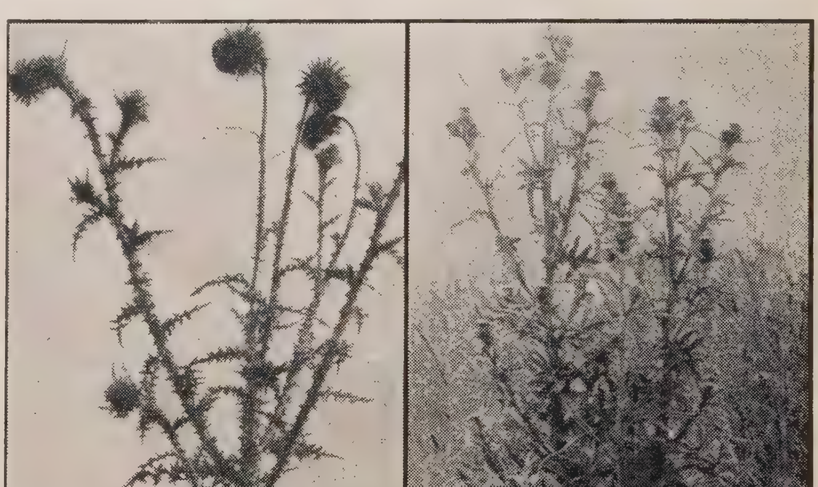
Nodding Thistle can become a Serious Pest on Good Land

NODDING thistle or musk (*Carduus nutans*) is a biennial plant similar in growth habit to the spear or Scotch thistle. On poor ground or under adverse conditions it may grow only one stem that bears a solitary large flower, but where conditions are more suitable it will grow vigorously into a bushy plant, and may send out a large number of branches that will grow to 4 or 5ft. high.

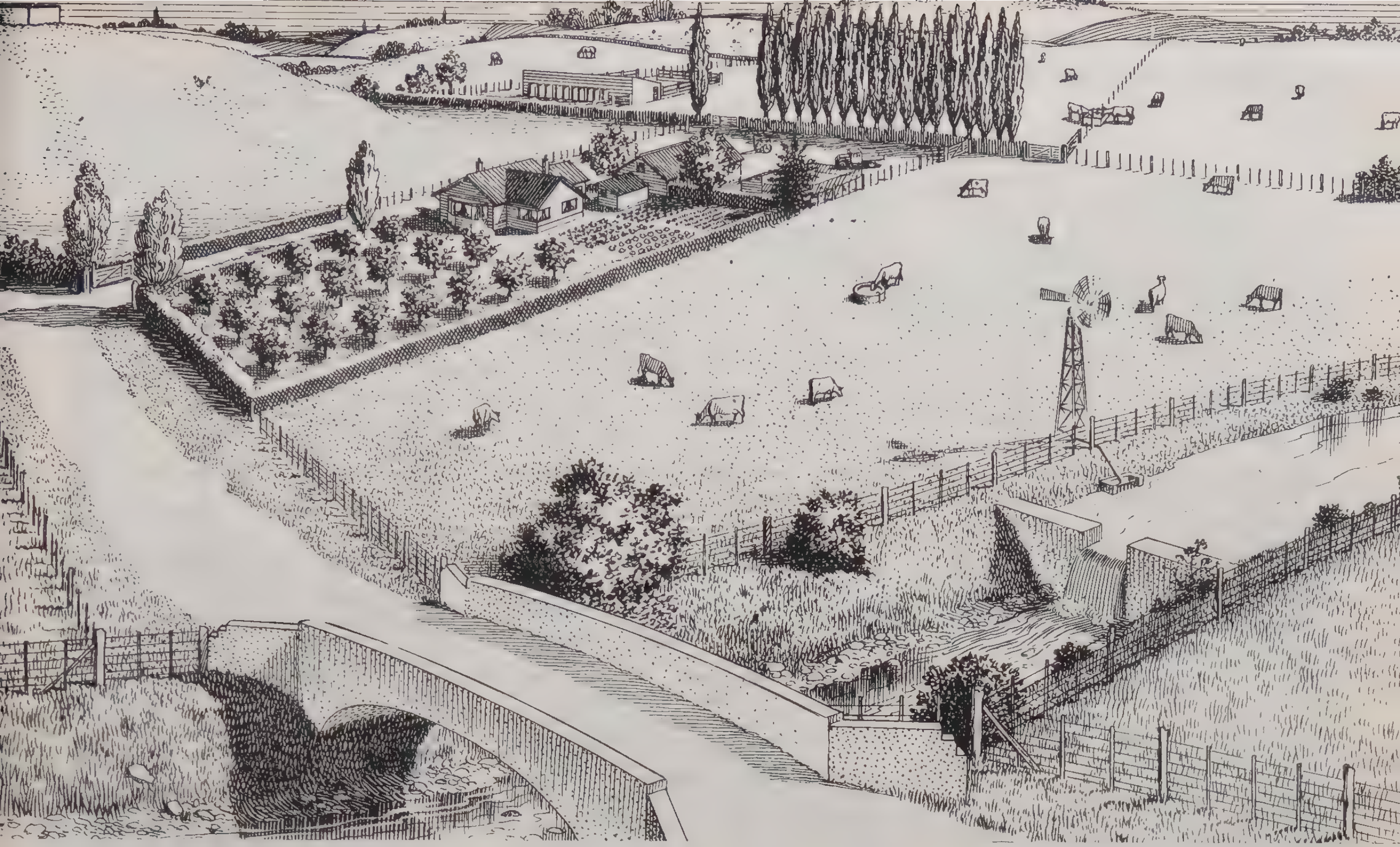
On the better type of soil the plant can become a serious pest. The rosette of sharp, spiny leaves may cover a circle 15 to 20in. in diameter, smothering out the pasture beneath. If left to ripen, one plant will soon provide enough seedlings to cover a considerable area. Stock will not graze close to the plants if they can avoid doing so, which means that feed is lost.

Nodding thistle is often erroneously called star thistle, but it belongs to a different family. Flowers of nodding thistle are bright crimson to purple and grow on a flattish head, surrounded by strong spines. As the head ripens it tends to droop at right angles to the stem—hence the name nodding thistle.

—*R. INCH, Fields Instructor,*
Department of Agriculture,
Ashburton.



The nodding thistle (left) is similar in growth habit to the spear or Scotch thistle (right), but these photographs show that there are easily-recognisable differences.



ESTABLISHING A FARM WATER SUPPLY SYSTEM

A SATISFACTORY piped water supply good in quality and adequate in quantity is recognised as a prime necessity in most branches of farming. All farms need water for human consumption, and farms carrying stock need drinking water in fields and buildings. Dairy farms need water for washing and sterilising, and there is an ever-growing use of water for crop irrigation. In this article, the concluding section of which will be published in next month's "Journal," H. W. T. Eggers, Engineer, Department of Agriculture, Wellington, describes the establishment and maintenance of a farm water supply and deals with problems likely to arise in its operation.

NEW ZEALAND is fortunate in having an abundance of natural water in rivers, streams, lakes, and underground water-bearing strata and an equitable rainfall, and the problem of water supply on most farms is the diversion with the least expenditure of effort and money of available water into a piped system so that it can be made available in sufficient quantities when and where required.

If a piped water supply system* is to be satisfactory, certain essential requirements must be complied with, and these in order of importance are:—

1. **Purity.** The bacteriological quality of water used for drinking and dairy washing must conform to definite standards of purity.

2. **Quantity.** There must be sufficient water available to cope with the peak demand.

3. **Pressure.** The static pressure in the pipe system must be sufficient to make water flow readily to all points of outlet.

4. **Volume.** Pipe systems must be proportioned in relation to the static pressure to allow water to reach points of outlet in sufficient volume.

5. **Hardness and Quality.** These are determined by the mineral contents of the water. Hard water contains excessive amounts of mineral salts of calcium and magnesium and is undesirable because of the sludge and deposits it forms in heating systems and the heavy consumption of soap it causes. Excessive amounts of other minerals such as iron can cause endless trouble by forming deposits which block pipes and coolers. The methods of removing the mineral contents of water are discussed in a later section of this article.

Estimating Requirements

Before a piped supply of water is installed on a farm careful planning of the system is necessary, the principal consideration being economy. The first step in planning a piped water supply is to decide where and for what purposes water is required and to estimate the quantity of water required on a 24-hour basis. The purposes for which water is required on the farm include domestic use, washing and sterilising in the milking shed, watering of stock in paddocks, cultivation of crops in the garden and orchard, fire-fighting, and general purposes.

The amount of water required daily can be estimated from Table 1, which shows the average quantities consumed on a farm by each person and animal. The estimate will be only approximate, as requirements vary, but an estimate is necessary as a basis for deciding the source of water supply and proportion of supply system components. Owing to the percentage variation of dry-matter content of pasture in different seasons it is not possible to give in the table even an average figure relative to the amount of water required by stock. The percentage of dry-matter

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* The term "water supply system" is understood in this article to mean the combination of equipment such as piping, pump, reservoir, valves, and controls used to deliver running water from the natural supply to the points of outlet of the plumbing system.

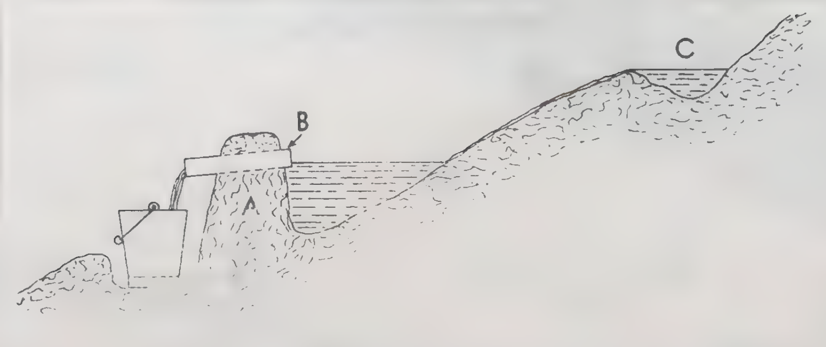


Fig. 1—Method of measuring the flow of water from a spring. A—Temporary dam. B—Tile. C—Spring.

content of pasture varies from as low as 13 per cent. in a wet season to as high as 24 per cent. in a dry season, so that the amount of natural water required by stock will vary from season to season and from year to year. For this reason the figures given in the table are based only on experience and are perhaps liberal; for example, one sheep would probably not need as much as 1½ gallons of water per day or one milk-producing cow 30 gallons. However, basing a calculation on these requirements allows in the case of the cow for such needs as washing of the milking shed floor and washing of utensils.

TABLE 1—AVERAGE DAILY CONSUMPTION OF WATER

	Gallons per 24 hours
For each person (running water in kitchen only)	12
For each person (running water in kitchen, bathroom, and laundry)	25
Each horse	12
Each steer, heifer, or dry cow ..	12
Each milk-producing cow	30
Each pig	2
Each sheep	1½
Poultry per 100 birds	4

Though the table allows for domestic and stock requirements, it does not allow for the quantities of water required for garden, orchard, and general purposes, which must be estimated from experience.

Source of Supply

The source of supply, which must comply with purity requirements, may be a river, a stream, a spring, underground water-bearing strata (from which water may be taken either by a well or bore hole) with or without artesian pressure, or, if no natural water supply exists, roof catchment of rain-water may be necessary.

When a source of supply has been found within a reasonable distance its suitability for human consumption and its hardness have to be determined. The local health inspector can decide its suitability for human consumption and its hardness can be ascertained by the test described in the section dealing with water softeners.

Before selecting a source of water as the source of the farm supply the farmer has to decide whether there will be enough dry-weather flow to maintain or exceed requirements. If the supply is a spring or stream, the flow can be measured in the following manner: For small streams or springs a temporary dam is erected below the source as shown in Fig. 1 and the water caught in a bucket of known capacity placed below the dam. From the quantity collected in a given period the rate of flow per hour or per day can be calculated.

To measure the flow of large streams a "weir board" must be used. The stream should be dammed up a few inches, and a notched board fixed on top of the dam as shown in Fig 2. The notch should be chamfered off to a thin edge and the width of the notch should be about two-thirds the width of the stream and for convenience an even number of feet. A peg should be driven into the ground, say 3ft. back from the board in the still water, with its top exactly level with the bottom of the notch. (The notch board should be set perfectly level, and this may be tested, and also the level of the peg, by observation just as water rises to the bottom of the notch.)

The discharge in gallons per minute can be found by first measuring the depth of water passing over the peg (the depth is the distance from the top of the peg to the surface of the still water) and calculating from the data given in Table 2. Thus, if the width of the notch is 4ft. and the depth of water passing over the peg is 1¾in., the discharge of water is 296 gallons per minute (74 gallons per minute for each foot of width × 4).

TABLE 2—DISCHARGE OF WEIR BOARDS

Depth in.	Discharge per ft. width in gals. per min.	Depth in.	Discharge per ft. width in gals. per min.
⅜	7	2¼	108
½	11	2½	126
¾	20	2¾	146
⅞	26	3	166
1	32	3¼	187
1⅛	38	3½	209
1¼	45	3¾	232
1⅜	51	4	256
1½	58	4½	305
1⅝	66	5	358
1¾	74	5½	413
1⅞	82	6	470
2	90	6½	531
		7	593

The output of underground water-bearing strata is more difficult to assess. If the presence of underground water is known, an estimate of flow can probably be obtained from a nearby bore or well. The flow of a well can be measured in two ways: First, by bailing or pumping the water level down a few feet and then bailing and measuring only as fast as the water flows in. Second, by bailing or pumping the well almost dry and bailing and measuring as fast as the water flows in. Of these two methods the first is probably the more accurate, because when the level of the water is lowered a considerable distance the flow will be increased above normal for several hours. If bailing or pumping at a rapid rate fails to lower the level of the water materially, the well is certain to be adequate for all ordinary purposes.

The adequacy of a well will be determined to some extent by its storage capacity; the storage capacity plus the rate of flow should be sufficient to cope with peak demands. As drilled wells or bores usually have less storage capacity than dug wells, the drilled well should have a better flow to meet the same demands.

A drilled well with artesian pressure that will raise the water without the use of a pump presents no problem, as the flow will depend on the pressure and size of pipe and can be measured at the surface.

The output of a drilled well without artesian pressure can be ascertained only by pumping, and the daily output will be the maximum quantity that can be pumped in 24 hours without pumping the well dry. Any test of this nature should be carried out for a period of days to ensure that the

TABLE 3—CAPACITIES OF CYLINDRICAL TANKS IN GALLONS

Depth of Tank in Feet	Diameter of tank in feet									
	3	4	5	6	7	8	9	10	11	12
3	130	235	370	530	720	940	1190	1470	1782	2120
4	175	315	490	710	900	1260	1590	1965	2375	2827
5	220	395	615	880	1200	1570	1990	2455	2957	3530
6	265	475	735	1055	1450	1885	2385	2945	3550	4236
7	310	550	860	1240	1680	2220	2785	3440	4141	4942
8	355	630	980	1415	1925	2515	3180	3925	4733	5648
9	400	710	1105	1590	2165	2825	3580	4420	5315	6350
10	445	785	1230	1765	2400	3140	3975	4910	5915	7060
11	490	860	1350	1940	2650	3450	4375	5400	6533	7774
12	535	935	1470	2120	2910	3770	4770	5890	7127	8481

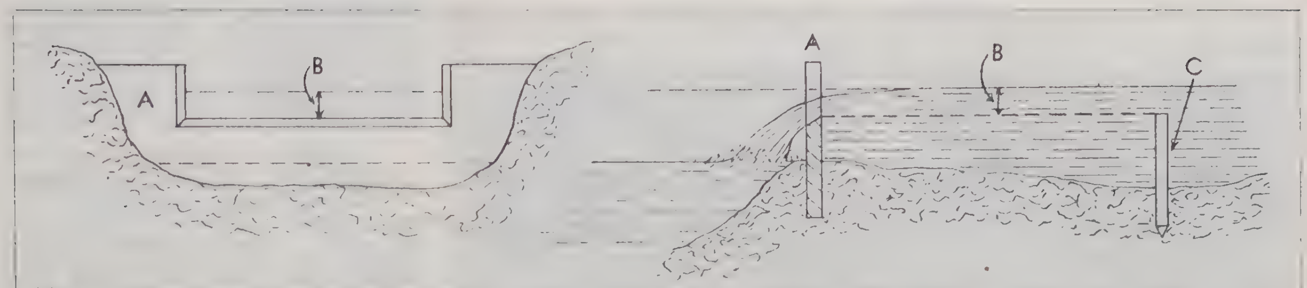


Fig. 2—"Weir board" method of measuring the flow of a stream. Left: A—Weir board. B—Depth of water passing through the notch. Right: A—Weir board. B—Depth of water passing through the notch. C—Peg.

bore has not just tapped a water pocket.

If rain-water is to be relied on as a source of supply, the tank capacity needed will depend on the demand and the amount and distribution of the rainfall, which can be gauged either from experience or by inquiry in the district. As rain is intermittent, storage is the prime factor in a rain-water supply, and this can be arranged either above ground with a slight fall to the outlet points or below ground with a pump to lift the stored water to a small gravity tank feeding the pipe system. These arrangements are dealt with more fully in a later section.

As the daily demand can be calculated, sufficient storage should be provided to ensure a supply of water over known summer conditions. For example, if it is ascertained that long dry spells occur during the summer, provision can be made for storage of winter rainfall over and above daily requirements to tide over such spells

The capacity of any tank or cistern can be determined easily by finding the volume in cubic feet and multiplying by 6.25, which is the number of gallons in 1 cub. ft. of water. Table 3 gives the capacities of cylindrical tanks of various sizes and Table 4 the capacities of rectangular tanks.

TABLE 4—CAPACITIES OF RECTANGULAR TANKS

Length		Width		Depth		Imp.
ft.	in.	ft.	in.	ft.	in.	gallons
2	0	1	5	1	5	25
2	3	1	8	1	8	40
2	6	1	11	2	0	60
2	10	2	3	2	0	80
3	2	2	3	2	3	100
3	6	2	7	2	8	150
3	10	2	11	2	11	200
4	2	3	3	3	0	250
4	6	3	7	3	0	300
5	10	3	9	3	0	400
7	6	4	1	3	2	600
8	3	4	5	3	6	800
8	3	4	11	4	0	1000
9	0	6	0	4	8	1500
9	6	6	3	5	4	2000

Water Supply Systems

Most water supply systems may be classified under three headings:—

1. Gravity water systems.
2. Hydro-pneumatic water systems.
3. Pneumatic water systems.

Gravity System

The gravity water system is by far the most common and consists of a storage tank or reservoir located higher than the points of outlet, to which the water flows by the force of gravity.

It can be classified into three types:—

1. Natural gravity, where the source of supply is high enough above the point of outlet to provide a satisfactory flow, as in the case of a spring on a hill above a dwelling.

2. Pumped gravity, where the supply at a lower elevation is pumped to a reservoir or tank at an elevation sufficiently high to permit natural flow to the points of outlet.

3. Siphon gravity, where the source of supply is at a higher elevation than the point of outlet, but where there is a still higher elevation between the two. This is the same as the natural gravity system, but the water must be siphoned over the higher elevation between supply and outlet.

Hydro-pneumatic System

In the hydro-pneumatic system water is pumped into the bottom of a large air vessel until the pressure of the trapped air is sufficient to force the water to the highest point of outlet. The system is suitable for locations where the natural supply has sufficient constant volume to meet all demands and there is also an electric-power supply.

For this system to be satisfactory the pressure of air in the chamber must be maintained automatically by an electrically-driven pump controlled by a pressure switch. As water is forced to the outlets and the air pressure drops, the switch automatically starts the pump, thereby building up the pressure, which stops the pump when the required amount is reached. One disadvantage of this system is that, as the only reserve is the water contained in the tank, the water supply must be shut down if the pump is stopped for overhaul, because the reserve supply cannot exceed half the tank capacity.

This system generally is fairly complicated and precautions have to be taken against a "waterlogged" cylinder and excessive pressure; the electric motor should also be provided with overload and low-voltage protection devices.

When the cylinder is waterlogged it becomes filled with water only, because when water and air are confined together under pressure the water will absorb the air. As the water is drained out the air is carried out with it and in time the volume of air is depleted sufficiently to allow the pressure to drop very quickly when the water is drawn out, causing the pump to start each time a tap is opened. This can be guarded against by fitting a snifting valve (similar to a bicycle valve) on the suction side of the pump, which permits a small quantity of air to be pumped in with the water. Excessive pressure can be guarded against by fitting a pressure relief or safety valve.

Pneumatic System

The pneumatic system is not common, but is useful in some situations where an electric-power supply is available. In this system air pressure in a receiver or tank is automatically maintained with an electrically-driven air compressor. Compressed air is piped to the well and used with either an ejector or air pump to force the water out and up to the points of outlet. With an air pump and a suitable arrangement of check valves, the pump does not operate unless the pressure on the discharge pipe is released by opening a tap. Though this system has no storage, it can be used in conjunction with a gravity supply system.

The advantages of the system are that water can be drawn from any number of sources with one power unit, and compressed air is available for other purposes such as inflating tyres and spray painting.

The pneumatic system is fairly expensive, as double pipelines must be run from the natural supply, one for water and one for air, and is therefore not economical where less expensive systems can be used. In certain situations, however, it has advantages. For example, if water has to be piped from a source over a hill the pneumatic system would be more satisfactory in forcing it than a suction pump would be in drawing it because of the likelihood of the suction pump's giving trouble through an accumulation of air in the high point in the suction pipe. This difficulty can also be overcome by a remote-controlled, electrically-driven pump.

Pressure, Storage, and Volume

Sufficient storage must be provided to supply peak demand, and to enable the water to flow to the highest point of outlet sufficient pressure in the system is necessary.

Pressure

Pressure in a gravity water supply system is dependent entirely on the "head" of water above the points of outlet. The term head refers to the vertical height of a column of water above a certain point and is considered as causing or counteracting the flow of water. For example, if water stands at a height of 20ft. in a pipe (as shown in Fig. 3) there is 20ft. of head at the bottom of the pipe. This 20ft. of head exerts a total pressure on the bottom of the pipe equal to the weight of the water, and this pressure is expressed in terms of pounds per square inch. As a column of water 1in. square and 1ft. high weighs 0.434lb., the pressure per square inch on the bottom of the 20ft. pipe equals 20 × 0.434, or 8.68lb., per square inch. If the bottom of the pipe were open, this head would cause the water to flow out.

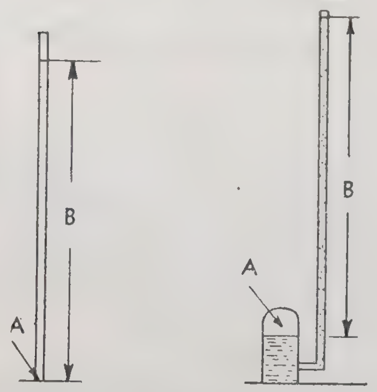


Fig. 3 (left)—Gravity head. A—Pressure = 8.68lb. per square inch. B—20ft. gravity head. Fig. 4 (right)—Pressure head. A—10lb. pressure. B—23ft. equivalent pressure head. As the pressure of air on the water in the tank is 10lb. per square inch, the pressure head is equivalent to 23ft. gravity head.

There are four kinds of head: Gravity head, pressure head, friction head, and suction head.

Gravity head is the actual vertical height of a column of water (see Fig. 3).

Pressure head is the vertical height to which a given pressure will force water (Fig. 4). As 1lb. of pressure will force water to a height of 2.3ft., the pressure head in feet is equal to pounds pressure multiplied by 2.3. For example, in a tank of water in which there is 10lb. pressure per square inch the water will rise in a vertical pipe to a height of 23ft. (10 × 2.3).

Friction head is the head required to overcome friction between flowing water and pipes. Water is caused to flow through pipes by gravity head, pressure head, or suction head. It is retarded in its flow by friction, which is measured in head and is called friction head, which may also be considered as lost head or obstructing head. Before water can flow the gravity head, pressure head, or suction head must first overcome the friction head. The amount of head lost because of friction depends on the following factors: 1. The length of pipe; 2. the diameter of the pipe; 3. the smoothness of the inside of the pipe; 4. the number and kind of fittings, valves, etc., in the pipeline; and 5. the rate of flow.

To obtain a flow of water to the highest point of draw-off the gravity head of the supply must be at least equal to the friction head in the pipe connecting the supply to the draw-off.

Suction head is a term applied to pumps, and is considered as the total equivalent head in feet on the suction side of the pump against which the pump must work to get water. The equivalent suction head is made up of gravity head and friction head. If a pump is "sucking" water up a vertical distance of, say, 15ft. (see Fig. 5), the suction head on the pump will be 15ft. plus the corresponding amount of friction head. Where the suction pipe is a considerable length the friction head may be large. If the vertical distance between the water level and the pump were 15ft., and a long horizontal suction pipe caused 5ft. additional head owing to friction, the pump would be working against a total of 20ft. of equivalent suction head.

In calculating the lift of a pump, suction head must be added to discharge head to find the total head against which the pump must work.

TABLE 5—FEET HEAD OF WATER AND EQUIVALENT PRESSURE

Feet head	lb. per sq. in.	Feet head	lb. per sq. in.
1	0.43	130	56.30
2	0.87	140	60.63
3	1.30	150	64.96
4	1.73	160	69.29
5	2.17	170	73.63
6	2.60	180	77.96
7	3.03	190	82.29
8	3.40	200	86.62
9	3.90	225	97.45
10	4.33	250	108.27
20	8.68	275	119.10
30	12.99	300	129.93
40	17.32	325	140.75
50	21.65	350	151.58
60	25.99	400	173.24
70	30.32	500	216.55
80	34.65	600	259.85
90	38.98	700	303.16
100	43.31	800	346.47
110	47.64	900	389.78
120	51.97	1,000	433.09

TABLE 6—PRESSURE AND EQUIVALENT FEET HEAD OF WATER

lb. per sq. in.	Feet head	sq. in. lb. per	head Feet
1	2.31	110	253.98
2	4.62	120	277.07
3	6.93	125	288.62
4	9.24	130	300.16
5	11.54	140	323.25
6	13.85	150	346.34
7	16.16	160	369.43
8	18.47	170	392.52
9	20.78	180	415.61
10	23.09	190	438.90
15	34.63	200	461.78
20	46.18	225	519.51
25	57.72	250	577.24
30	69.27	275	643.03
40	92.36	300	692.69
50	115.45	325	750.41
60	138.54	350	808.13
70	161.63	375	865.89
80	184.72	400	922.58
90	207.81	500	1,154.48
100	230.90	1,000	2,309.0

Every foot of elevation is equal roughly to ½lb. of pressure per square inch, and this allows for ordinary friction.

Atmospheric pressure at sea level is about 15lb. per square inch, and if a perfect vacuum were attained in a suction pipe at that level, the pressure would raise the water about 30ft. However, owing to the inefficiency of the pump and friction head this is not possible in practice, and the maximum suction head obtainable at sea level

TABLE 7—FRICTIONAL RESISTANCE IN FEET OF HEAD PER 1000ft. OF PIPE

Rate of flow in gals. per hr.	Size of pipe				
	½in.	¾in.	1in.	1¼in.	1½in.
50	20	3	—	—	—
60	28	5	—	—	—
70	37	6	—	—	—
80	48	9	—	—	—
90	61	11	—	—	—
100	75	14	3	—	—
120	115	19	4	—	—
140	160	26	6	—	—
160	220	35	8	—	—
180	260	44	10	—	—
200	300	54	12	5	—
220	—	65	15	6	—
240	—	78	18	7	—
260	—	92	21	8	—
280	—	106	25	9	—
300	—	122	29	10	—
320	—	138	33	12	—
340	—	155	39	14	—
360	—	175	42	16	—
380	—	195	46	18	—
400	—	217	50	19	7
420	—	238	55	20	—
440	—	263	60	22	—
460	—	290	65	25	—
480	—	305	72	27	—
500	—	330	79	29	10
520	—	—	85	32	—
540	—	—	92	34	—
560	—	—	100	36	—
580	—	—	107	39	—
600	—	—	115	42	15

The friction in a 90-degree elbow is about equal to the friction in 10ft. of straight pipe.

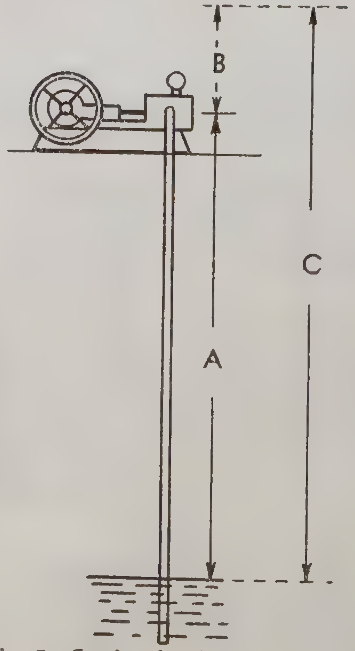


Fig. 5—Suction head on a pump is made up of gravity head plus friction head. A—Gravity head. B—Friction head. C—Total equivalent suction head.

is 26 to 28ft. This height will decrease with altitude and reduced atmospheric pressure.

As head in some form must be considered in all pipe computations, the data in Tables 5, 6, and 7 will facilitate calculation.

Storage

The storage of water is necessary for three reasons:—

1. As the flow of the natural supply is probably continuous while the demand is intermittent, the storage must act as a buffer or equaliser between supply and demand. This is the reason for calculating demand on a 24-hour basis and not on momentary peaks, as it is only by basing demand and supply on an equal time factor that a comparison can be made.

2. Though the flow of the natural supply may be continuous, it can also be subject to seasonal fluctuations, and sufficient storage is therefore necessary to provide for any shortage in natural supply.

3. Storage must be sufficient to cope with any known peak demands; for example, if a large quantity of water is required over a short period for crop irrigation, the demand must be reckoned on a 24-hour basis for comparison with the flow of the natural supply, and sufficient storage provided to supply the quantity required over the given period.

The necessary storage capacity for a water supply scheme depends on whether the natural supply is continuous or intermittent. If the natural supply is continuous, the minimum amount of storage required will be the capacity necessary to hold the estimated daily demand plus, say, 20 per cent. extra to provide for emergencies. If the natural supply is intermittent, the minimum amount of storage will be the capacity sufficient to hold the estimated daily demand, the quantity of water necessary to compensate for the loss of supply on days when the natural supply is likely to fail, and allowance for emergencies. This is particularly important where the natural supply is pumped to the point of storage, as provision must be made in storage capacity to tide over any period when the pump is likely to be out of action for overhaul or repairs.

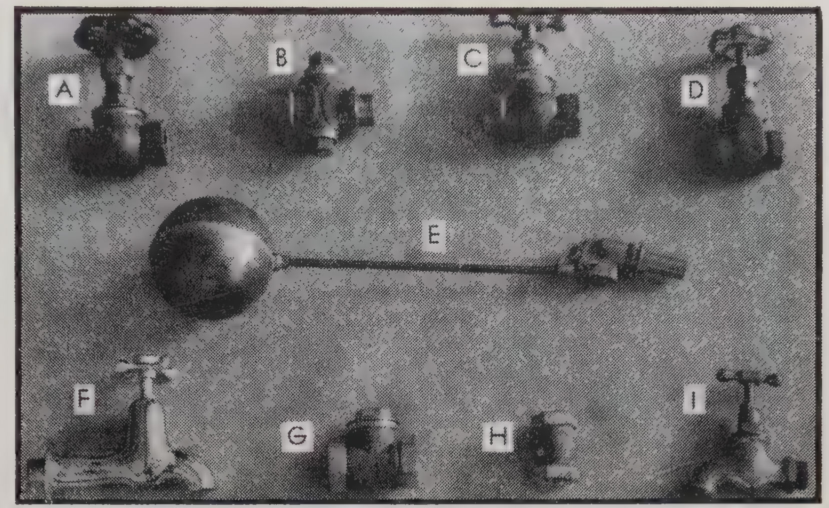


Fig. 7—Valves and taps. A—Globe valve. B—Plug-cock. C—Stop-cock. D—Gate valve. E—Ball valve. F—Chromium-plated domestic tap (bib-cock). G—Horizontal check valve. H—Vertical check valve. I—Hose tap. Globe valves, plug-cocks, stop-cocks, and gate valves can be used as stop or isolating valves, globe valves, stop-cocks, and gate valves for medium or high-pressure and plug-cocks for low pressure. Gate valves should be used where rapid flow is required or where pipe friction must be avoided. Ball valves are used where automatic flow to cisterns or tanks is required. Horizontal check valves are used on horizontal mains and vertical check valves on vertical.

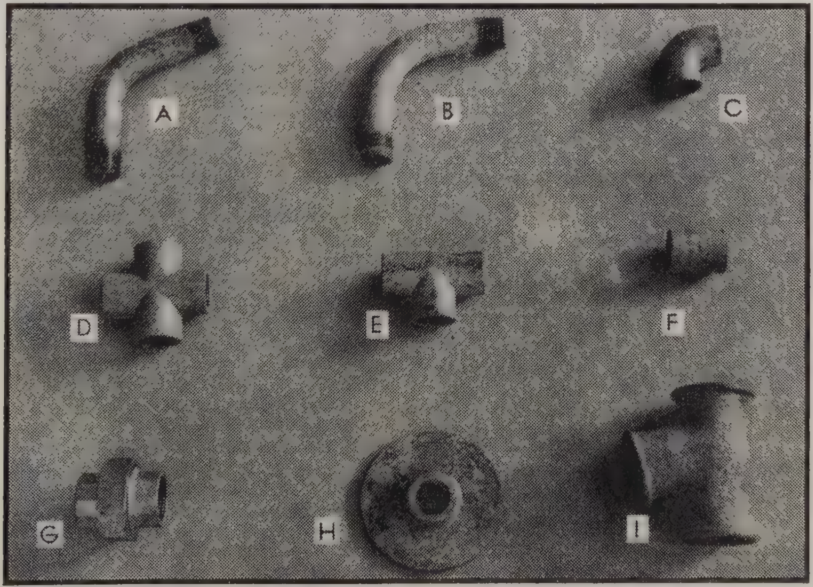


Fig. 6—Pipe fittings. A—45-degree spring (30-degree and 15-degree springs are also available). B—90-degree bend. C—Round elbow (square elbows are also available). D—Cross. E—T piece. F—Socket. G—Nut union. H—Flange. I—Y piece.

If the source of supply from river water, stream water, spring water, or underground water-bearing strata is available at a sufficiently-high elevation above the point of outlet of the pipe system to compensate for friction head, storage and a suitable pipeline are all that is required. If there is sufficient water to allow for constant overflow, it can be stored in an enclosed dam; otherwise a concrete tank must be installed. Where the source of supply is below the level of the point of outlet of the pipe system, storage must be provided above that level and the water pumped or elevated to the point of storage. Storage can be provided by a tank placed on a hillside or on legs at an elevation sufficient to overcome the friction head of the reticulation piping, and a pipeline for pressure head will be run from the point of supply to the storage. The pressure head in the pipeline will be supplied by a pump or other means.

Volume and Pipe Proportion

Pipe systems must be proportioned in relation to the static pressure to allow water to reach points of outlet in sufficient volume. As the rate of flow of water from an outlet point depends on the pressure or head, any obstruction to the available head, such as friction head, must be eliminated, though economy has to be considered.

It will be apparent that friction loss (as shown in Table 7) increases very rapidly with relatively-small increases in flow, but diminishes considerably with slight increases in the size of pipe used. The correct proportioning of pipes for any service is a balance between economy of installation (cost of pipe) and service requirements. If the desired flow at the outlet is determined, the smallest size of pipe that

CROSS-SECTIONS OF DIFFERENT TYPES OF PUMPS

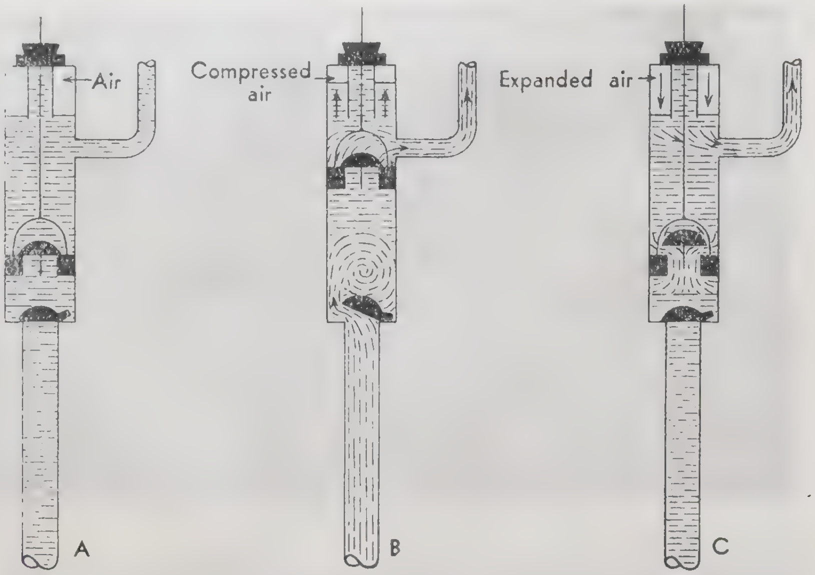


Fig. 8—Simple force pump, showing three stages of operation. A—Pump stationary. B—On the upward stroke of the plunger water is drawn in below the plunger and discharged above it. C—On the downward stroke of the plunger the expanding air in the air chamber maintains a flow from the pump.

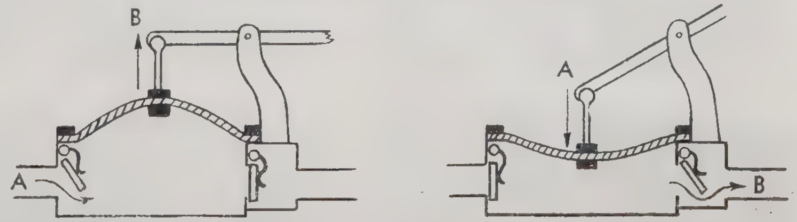


Fig. 9—Diaphragm pump. Left (intake stroke): A—Direction of flow. B—Direction of travel. Right (discharge stroke): A—Direction of travel. B—Direction of flow.

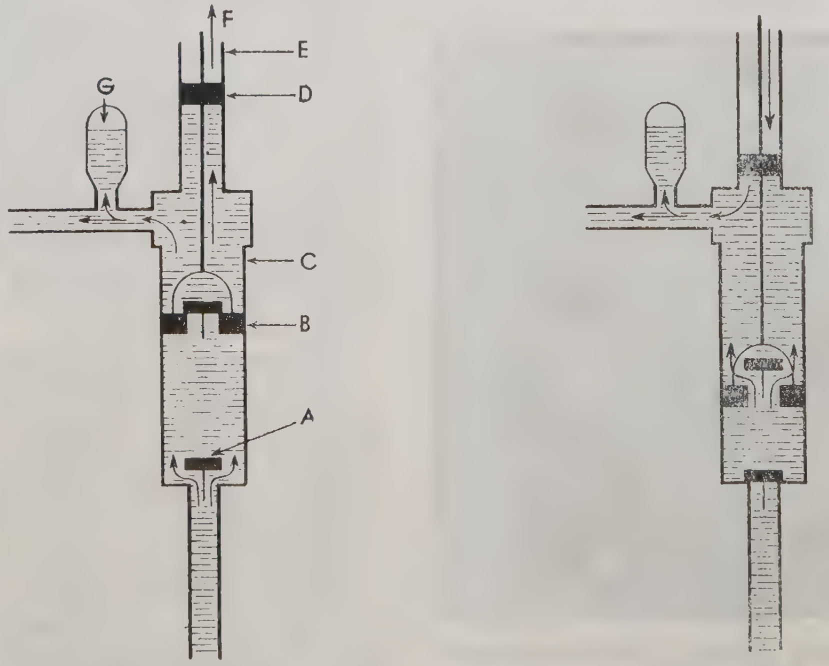


Fig. 10—Differential pump at two stages of operation. Left: Water is being drawn from the well below the main plunger and at the same time is being discharged above the main plunger to the tank, air chamber, and differential valve. A—Check valve. B—Main plunger. C—Main cylinder. D—Differential plunger. E—Differential cylinder. F—Direction of travel. G—Air. Right: The main plunger is passing downward through the water while the differential plunger is discharging.

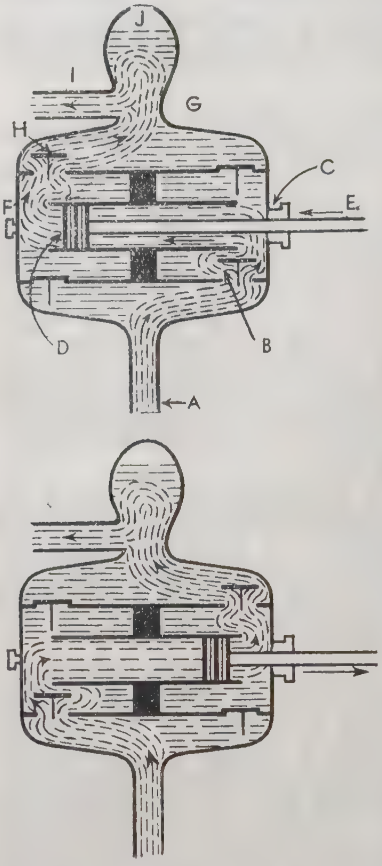


Fig. 11—Two stages of operation of a horizontal double-acting pump. Upper: On the inward stroke of the plunger the intake is on the lower right and the discharge on the upper left. A—Suction pipe. B—Inlet valve. C—Stuffing box. D—Plunger. E—Direction of travel. F—Air valve. G—Cylinder. H—Discharge valve. I—Discharge pipe. J—Air. Lower: On the outward stroke of the plunger the intake is on the lower left and the discharge is on the upper right.

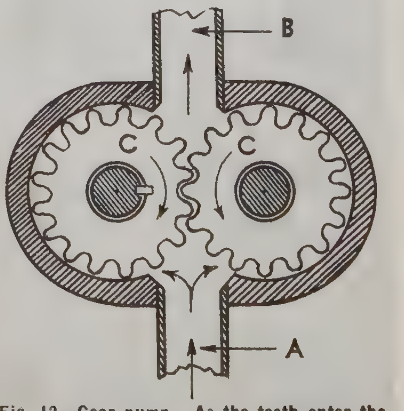


Fig. 12—Gear pump. As the teeth enter the shrouding a partial vacuum is created over the intake, which permits atmospheric pressure to force liquid into the pump, filling up the spaces between the teeth. As rotation continues the liquid between the teeth is carried around the outer sides of the pump to the point where the teeth remesh. As the teeth remesh the liquid is squeezed out from between them, thus building up a pressure under the discharge. A—Intake. B—Discharge. C—Direction of rotation.

will provide that flow without excessive friction head is the most economical size to use. For example, the friction head of a ¾in. pipe giving a flow of 100 gallons per hour at the point of outlet is 14ft. per 1000ft. length. If the storage at a distance of 1000ft. were at less height than 14ft., the flow could not be maintained and a 1in. pipe would have to be installed. If the storage at a distance of 1000ft. is 12ft. above the point of outlet, a 1in. pipe will maintain a flow of 200 gallons per hour, whereas a ¾in. pipe will maintain a flow of slightly more than 90 gallons per hour.

The capacity of a pump is always stated as a number of gallons per unit of time per unit of height; that is, gallons per hour at so much head. The head given is usually total head and represents suction and delivery heads plus friction head. If friction head on the suction side can be reduced, more effective head is available on the delivery side, so suction and delivery pipes are usually proportioned by pump manufacturers to give a larger suction pipe.

If friction head in the delivery pipe can be reduced, an equivalent increase will be gained in pressure head. For example, if a ¾in. discharge pipe were used with a pump having an output of 960 gallons per hour (16 gallons per minute) at a discharge head of 100ft., very little water would be pumped, as the total pressure head would be absorbed in overcoming friction head. However, if the pipe size were increased to 1in. and the friction head for the same quantity reduced to about 26ft., an effective pressure head of 75ft. would be available; that is, the pump would deliver its rated capacity to a height of 75ft.

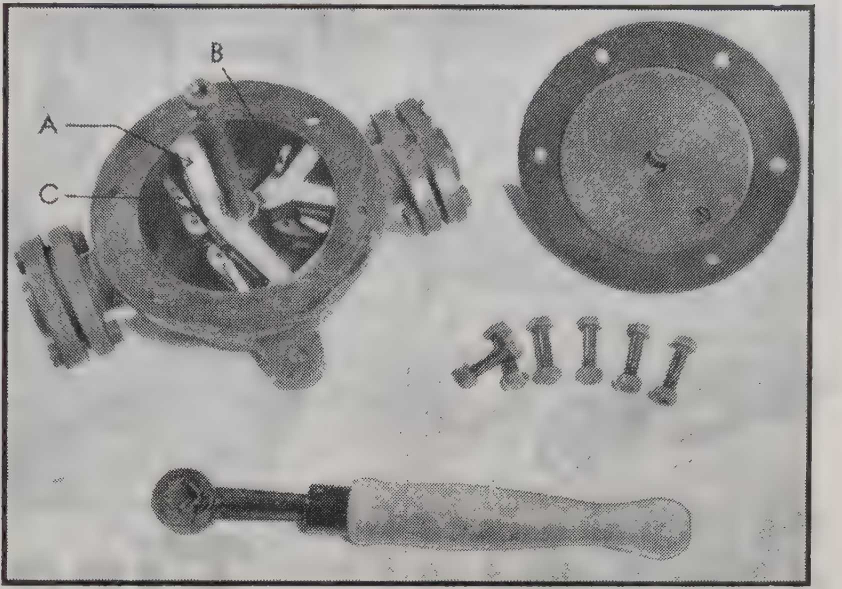


Fig. 14—Semi-rotary pump with cover removed. A—Rotor. B—Suction valves. C—Delivery valves.

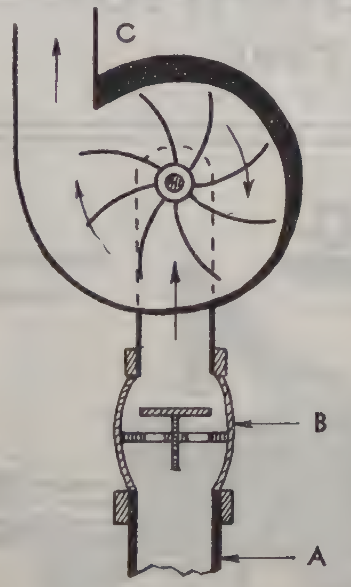


Fig. 13—Centrifugal pump. When the pump is primed the housing and impeller are filled with water. As the impeller rotates water is thrown out of the impeller blades by centrifugal force. This reduces the pressure at the centre of the impeller and more water flows in through the intake to fill the partial vacuum. As the impeller continues to rotate the water just admitted is thrown out in turn and more water flows in to take its place. In this way a constant stream of water is moved through the pump. A—Intake. B—Check valve. C—Discharge.

The capacity of a pipe varies as the square of the diameter. Thus, a 4in. pipe (4 × 4 = 16) has four times the capacity of a 2in. (2 × 2 = 4). Table 8 shows the rate of discharge in gallons per minute of different sized pipelines 1000ft. long.

Equipment for Water Supplies

Piping: As the piping used for farm water supplies is normally of the smaller sizes (under 3in.), galvanised-steel pipe can be used. All water pipes must be protected against corrosion both internally and externally, and larger-sized iron pipes, if not galvanised, are treated with a corrosion-resistant compound during manufacture.

Galvanised water pipe can be bought in various lengths in the following sizes, which are always the measured internal diameter: ⅜in., ½in., ¾in., 1in., 1¼in., 1½in., 1¾in. (rarely used), 2in., 2¼in., and 2½in. The lengths (usually about 20ft.) have standard pipe thread at each end and one end is provided with a socket or coupling. The other end may be provided with a "keep" (an internally-threaded ring placed over the pipe thread purely for protective purposes and of no use for connecting the pipes together).

Fittings

A wide range of galvanised pipe fittings is available to enable the piping to be joined to suit any pipe layout. The principal ones are shown in Fig. 6. Other fittings available but not illustrated are nipples and barrel nipples (for joining female fittings), reducing sockets (for joining two different-sized pipes), reducing bushes (for joining a smaller male pipe to a larger female fitting), and back nuts (for backing a socket on a running joint or locking pipes to tanks).

With these fittings a pipeline can be carried through any angle in any plane, as it is simply a matter of cutting and screwing the pipe to the lengths required and joining the lengths by suitable fittings.

Valves and Taps

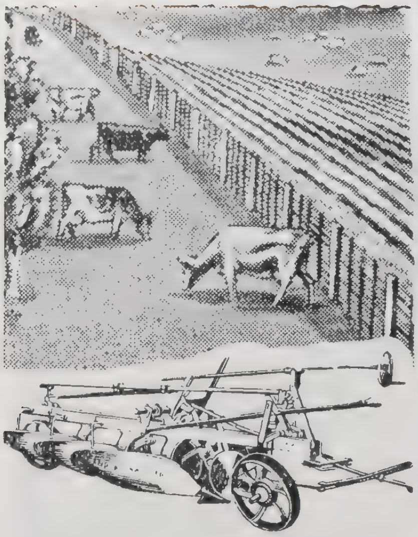
Various types of valves and taps for controlling the flow of water through pipes are shown in Fig. 7. Each has its own purpose and application as shown, and should be used accordingly.

Pumps

Pumps constitute perhaps the greatest assortment of equipment for diverting a natural water supply to a

TABLE 8—RATE OF DISCHARGE IN GALLONS PER MINUTE OF DIFFERENT-SIZED PIPELINES 1000ft. LONG

Head of fall in feet	Size of pipe				
	½in.	¾in.	1in.	1¼in.	1½in.
20	.6	1.7	3.5	6.4	9.8
30	.75	2.1	4.1	8.6	12.4
50	1.0	2.9	6.0	11.3	16.5
100	1.5	3.9	9.0	15.8	24.4
200	2.4	6.0	12.8	24.0	35.7



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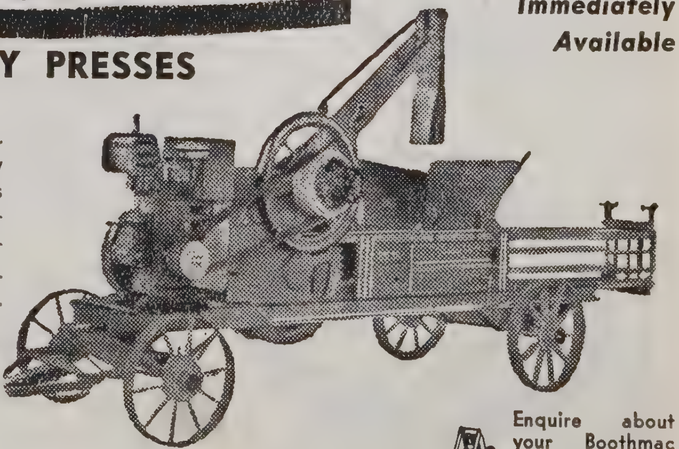

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piped system. There is a multitude of types and sizes of pumps built for various purposes and with varying capacities and heads. Before analysing the various types of pump available it is necessary to study the relationship of a pump to the general piped water supply scheme. As the water supply and storage must be related to the demand and the proportioning of the pipes must be related to head and friction, the choice of the type of pump necessary will depend on:—

1. The pump capacity needed (the number of gallons per hour the pump must deliver).

2. The height to which the pump must deliver the required quantity of water (the amount of head against which the pump must work).

3. The type of pump most suited to the work it is required to do (piston, displacement, ram, centrifugal, rotary, or gear type) and the manner in which it will be powered (from electric supply, an engine, wind, or water).

1. **Pump capacity:** A pump's capacity is defined as the number of gallons per minute that can be delivered against a given head. For economical reasons capacity must be closely related to demand and supply and, in addition, pumping time. This relationship is illustrated in the following example: In a water supply system where the demand is 1000 gallons per day, the water supply is taken from a permanent stream by pump, and the storage is a high-level reservoir the necessary reservoir capacity will be 3600 gallons (daily demand 1000 gallons, allowance for pump overhaul of 2 days 2000 gallons, and emergency allowance of 20 per cent. 600 gallons). With a storage capacity of 3600 gallons to be maintained against a draw off of 1000 gallons per day, the pump capacity must be more than 1000 gallons per day to enable the reservoir to be filled should it become empty. If the pump has a capacity of 1500 gallons per day and is working continuously, it would fill the reservoir at the rate of 500 gallons per day, or in 7 days the reservoir would be full, which can be considered a reasonable time.

However, if the pump does not work continuously and the reservoir is required to be filled in 7 days, the pump capacity has to be greater. To determine the size of pump it is possible to use in the allowable running time the daily demand has to be divided by the allowable running time in hours, which will give the capacity of the pump in gallons per hour necessary to maintain the daily demand.

Pump running time depends on three factors:—

(a) *Type of pump.* A hydraulic ram would probably be operated continuously, a float-controlled electric pump in accordance with the demand, a windmill pump in accordance with the duration of workable wind velocities, and a manually-operated, engine-driven, or electric pump in relation to the demand and its own capacity.

(b) *Type of power supply.* The type of pump is usually chosen to suit the power supply. A hydraulic ram is chosen where gravity head can be utilised, and electric pumps, either hand or float controlled, are chosen where there is an electric supply available at reasonable cost and of reasonable continuity. Windmill pumps are

TYPES OF PUMPS

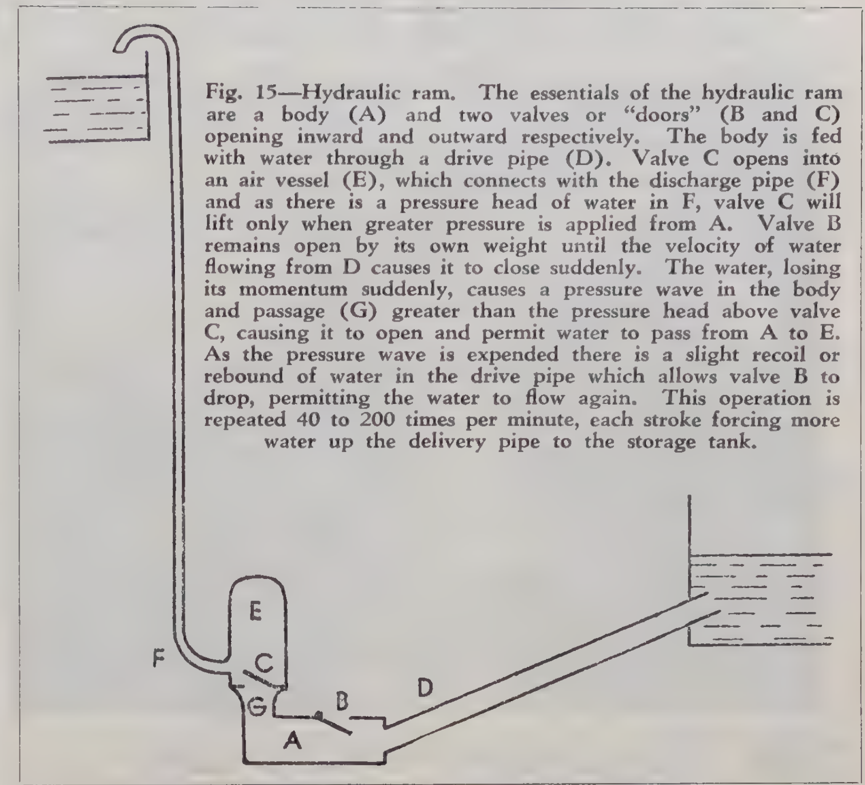


Fig. 15—Hydraulic ram. The essentials of the hydraulic ram are a body (A) and two valves or "doors" (B and C) opening inward and outward respectively. The body is fed with water through a drive pipe (D). Valve C opens into an air vessel (E), which connects with the discharge pipe (F) and as there is a pressure head of water in F, valve C will lift only when greater pressure is applied from A. Valve B remains open by its own weight until the velocity of water flowing from D causes it to close suddenly. The water, losing its momentum suddenly, causes a pressure wave in the body and passage (G) greater than the pressure head above valve C, causing it to open and permit water to pass from A to E. As the pressure wave is expended there is a slight recoil or rebound of water in the drive pipe which allows valve B to drop, permitting the water to flow again. This operation is repeated 40 to 200 times per minute, each stroke forcing more water up the delivery pipe to the storage tank.

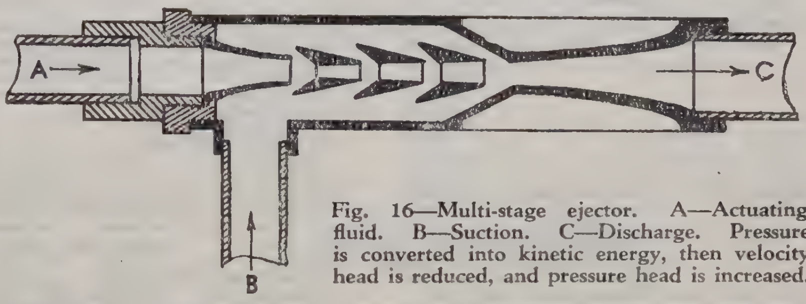


Fig. 16—Multi-stage ejector. A—Actuating fluid. B—Suction. C—Discharge. Pressure is converted into kinetic energy, then velocity head is reduced, and pressure head is increased.

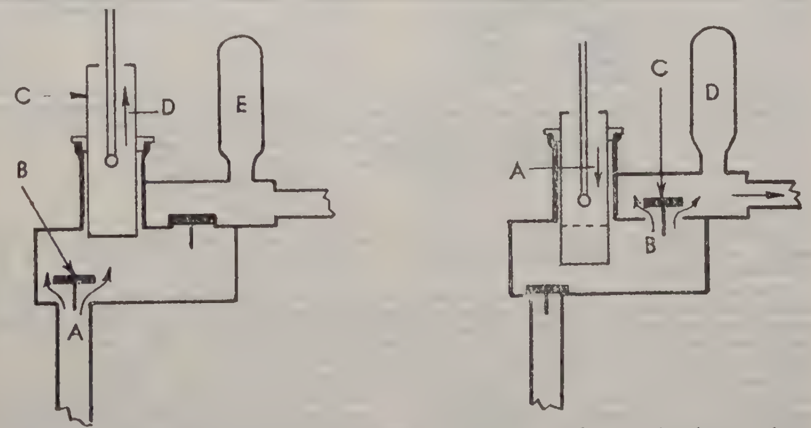


Fig. 17—Cross-section of a displacement pump. Left (at intake stroke): A—Direction of flow. B—Intake valve. C—Plunger. D—Direction of travel. E—Air. Right (at discharge stroke): A—Direction of travel. B—Direction of flow. C—Discharge. D—Air.

chosen where there are frequent winds of prolonged duration and workable velocities. Engine-driven pumps are chosen where no other source of power is available.

(c) *Location of pump in relation to homestead.* If the pump is located a long way from the homestead, the fewer visits that must be made for stopping and starting it the better it is for the farmer, as these visits take time which could be profitably employed in other work.

2. **Head:** The head of the pump will be determined by the choice of the most economical elevation for the reservoir or storage above the points of outlet. The pump is required to deliver the necessary daily quantity of water to the head in feet, which is the sum of: 1. Vertical height of storage above the pump; 2. friction head of delivery pipe, including bends and fittings; and 3. total suction head.

Force pumps are built of materials of different strength for operation at different pressure ranges. Where pressures are high (above 45lb.) it is necessary to use a pump guaranteed to work against the head required; that is, a pump built of materials heavy enough to stand the pressure.

3. **Type of pump:** The type of pump chosen should be the one most economically suited to the natural water supply and the power available; for example, where the natural supply is a stream with an abundance of running water of which only a small proportion is required to satisfy demand a hydraulic ram would probably be best. If, however, the natural supply is a well or bore in a district with workable wind velocities of prolonged duration, the most economical pump would probably be a windmill-driven pump.

In both these cases the utilisation of available natural power eliminates the cost of fuel or electric power, thereby reducing the pumping costs, and purchase and installation charges will probably compare more than favourably with similar charges for engine or electric motor-driven pumps with the same capacity. If an electric motor- or engine- driven pump is used, the type should be chosen to suit the head and location, though due consideration must be given to reliability. For example, for pumping to a very high head such as, say, 600ft., a multi-cylinder ram (not hydraulic ram) or displacement pump should be used. If pumping from a spring which can be provided with a pump suction chamber to enable a small gravity head to be placed on the suction side of the pump, a centrifugal pump can be used.

As each type and make of pump is designed for a particular application, the choice can be confined to one or two which suit the conditions under which the pump is to be used.

The various types of pumps are listed in Table 9 with details of the use of each type. If a list of requirement details is compared with the pump details, the pump which most nearly meets requirements can be ascertained. A brief description of how each type of pump operates is given in the captions of Figs. 8 to 17.

TABLE 9—TYPES OF PUMPS AND DETAILS OF USE

Type of pump	Use	Power needed	Capability	Limitations
Piston, comprising lift and force, and single and double acting (most common type) (Figs. 8 and 11)	Lifting and forcing water from one elevation to another; pumping from shallow wells, streams, tanks, dams, etc.	Hand, electric, steam, or oil engine or wind; rotary for conversion to reciprocating	Used for moderate heads, quantity and head depending on type and size of pump	Unsuited for very high heads
Diaphragm (Fig. 9)	Seldom used for water supply pumps except for irrigation, drainage, etc., at very low heads	Hand pump or mechanical as fuel pump on automobiles and tractors	Can handle liquids containing sediment; rate of discharge can be varied without altering pump	Suitable only for very low heads
Differential (Fig. 10)	Against high heads requires less power than piston pumps; suitable for deep wells and windmill or electric power	Oil engine, electric, or windmill; rotary for conversion to reciprocating	Gives fairly-uniform discharge, though single acting; quantity and head will depend on type and size of pump	Unsuitable for heads attainable with displacement pumps
Gear (Fig. 12)	Not as suitable for water supplies as for pumping heavy liquid	Rotary power only for transmission by belt, gears, or direct	Has no valves; gives uniform discharge at constant speeds and heads	Not suitable for very high heads
Centrifugal (Fig. 13)	Wide application; most efficient for handling large volumes of water at low heads; used effectively as deep-well pump	Rotary power only for transmission by belt, gears, or direct	Has only one moving part and no valves; can handle liquids containing solids; inexpensive and easy to maintain; must be designed to suit needs	Pump must be primed
Semi-rotary (Fig. 14)	As hand pumps for lifting and forcing to limited head	Hand pumps only	Being double acting, has more uniform discharge	Hand pump only
Hydraulic ram (Fig. 15)	Where running water is available	Gravity head; will operate with a fall as low as 20in. and a quantity of 1½ gals. per minute	Will pump 300 to 100,000 gals. to 1000ft. per day, depending on size and type; can pump clean water using polluted water as power	Delivery head and volume are proportionate to feed head and volume within efficiency of ram
Ejector jet (Fig. 16)	Can be used in conjunction with centrifugal or reciprocating pumps to lift water from deep wells (maximum 90ft.) for elevation to high-level storage; if used alone, most efficient for handling large quantities against medium heads	Actuating fluid under pressure such as steam, water, high-pressure vapour, gas, or liquid	Will handle gases, liquids, and even solids against a pressure less than that of actuating fluid; pump has no moving parts	If used singly, provision of fluid under pressure presents limitations; if used with another pump, this supplies fluid under pressure for operating ejector
Displacement (Fig. 17)	Suitable for very high heads; will handle abrasive or corrosive liquid	Electric, steam, or oil engine; rotary for conversion to reciprocating	Available in 2, 3, and 4 ram types always single acting; quantity and head depend on type and size of pump	Uneconomical for low heads

As three other types of pumps, air lift, chain, and bucket, are seldom used for water supply systems, they have not been included in this table, but the following is a brief description of each:—

The air lift pump consists of a drop pipe placed in a well with its lower end submerged. An air pipe delivers air at the bottom of the drop pipe and forms a mixture of air and water which is lighter than the column of solid water in the well; the mixture therefore rises above the surrounding water. A limitation of this method is that for low lifts the submergence of the drop pipe must be considerably more than the lift obtained.

Chain pumps consist of an endless chain hung from a sprocket attached to a crank handle and with its lower end submerged. The chain on one side runs through a lift pipe also with its end submerged. Equally spaced along the chain are rubber discs which just fit the lift pipe so that when the chain is revolved by the crank the passage of the chain and discs up the lift pipe raises the water to the level of the outlet.

The bucket pump also consists of an endless chain to which is attached a series of buckets which raise the water from the well and discharge it as the buckets pass over the top of the driving sprocket exactly as a bucket elevator lifts sand or gravel. The limitation of chain pumps and bucket pumps is that both are lift pumps only.

The Use of Fertilisers in the Home Garden

THE number of terms used to describe fertilisers or fertilising materials is rather confusing to most home gardeners, who often find difficulty in differentiating between "manure," "fertiliser," "plant food," and the more specific terms "organic," "inorganic," "mineral," "artificial," "natural," and "chemical." This article by A. G. Kennelly, Instructor in Vegetable Culture, Department of Agriculture, Christchurch, explains the use of fertilisers and natural manures and the part they play in the productivity of the home garden.

[*Green and Hahn Ltd. photo.*

Because of difficulties of mixing and applying small quantities of different fertiliser mixtures to closely-spaced rows of different vegetables it is often preferable to apply a complete fertiliser before sowing or planting. The area should first be marked off and the appropriate quantity of complete fertiliser mixed with soil or sand and scattered and raked in. When rainfall is low forking it in is usually preferable, as it encourages deeper rooting.

A SIMPLE definition of a manure is a substance which adds plant food to the soil and thus makes it more fertile (or fertilises it); it also has an effect on texture which may be good or bad. L. L. Van Slyke has defined a fertiliser as "any substance which when added to a soil will under favourable conditions produce a better growth of crops, whether through direct or indirect action on the crops or on the properties of the soil," and a "plant food" as "a substance which supplies any constituent necessary for the nourishment of plants and in a form suitable to promote their development or capable of being changed by natural processes into such a form."

In general the word "manure" is used to cover the whole range of fertilising materials. "Fertiliser" and, to a less extent, "plant food," though often used interchangeably with "manure," are commonly applied to artificial manure. The different kinds of fertiliser or manure can be more specifically classified as shown in the chart on the next page.

Soil will not continue producing crops year after year unless the plant foods removed by the crops are returned to it. The physical condition, too, must be satisfactory or it will be difficult to maintain good tilth. Good tilth means that it dries out reasonably quickly after rain, does not stick together in lumps, and when it is dry it does not cake or crack badly, yet has "body." It should work reasonably well under most conditions. Good soil is rich in organic matter; that is, in decomposing material, plants or animals, that was once living. In a few exceptionally-deep, fertile soils such as those that once formed bogs, or where because of the peculiar conformation of the land the area formed a trap for dust rich in organic material blown from surrounding areas, the layer of soil rich in organic material may be several feet deep, but usually it is only about a foot. If this layer is exhausted of its organic matter and plant foods, it will be impossible to grow satisfactory crops. Home garden soils require to be continually supplied with organic matter, as its removal in such soils is hastened because of its being continually, if slowly, burnt up or oxidised by liming and by the air admitted by frequent cultivations.

Inorganic Fertilisers

Inorganic fertilisers cannot bind the soil together and can do little, if anything, to improve it physically. Soils manured with nothing but inorganic fertilisers vary in their capacity for continued cropping, but without the addition of organic material the result ultimately must be the loss of the desirable "crumby" texture which is essential for good tilth and satisfactory production. The "crumbs" of soil soak up and hold water and the air spaces between them enable excess water to drain away quickly and facilitate penetration of the soil by the root hairs. Inorganic fertilisers are of great value in supplying or augmenting the principal plant foods in soils that have sufficient organic matter and where the soil temperature, moisture content, and degree of acidity (all factors more or less influenced by the amount of organic matter present) are satisfactory. Moisture in the right quantity is essential, as its dissolving action renders the plant food soluble so that it can be assimilated by the root hairs. Temperature greatly influences the rate of growth and acidity must be within narrow limits or the nutrition of the plant is affected.

Inorganic fertilisers are of mineral origin, and though commonly called chemical or artificial, when referred to specifically should more appropriately be termed mineral fertilisers. Artificial (and perhaps even chemical) is a more general term and can be used to include such organic materials as blood and bone and dried blood.

Successful commercial gardeners are invariably aware of the need to apply organic manure and many go to great trouble to obtain farmyard or stable manure or even such material as old well-rotted stack bottom. Home gardeners should consider its application not less important and the soil of most average-sized home gardens would benefit greatly from the application of at least a ton of such material each year. The minimum the home gardener should aim at is to dress at least one-third of his garden liberally with material such as farmyard manure or compost each year. Crop rotation is, of course, essential.

Soils in New Zealand vary greatly in their organic and mineral content and acidity, and no manurial recommendation, whether designed as a dressing for a particular crop or for the garden as a whole, will give optimum results on all garden soils.

A thorough understanding of the particular soil, of its cultivation, physical nature, degree of acidity, and the extent to which the principal plant food elements are present and available, together with a knowledge of the

FERTILISERS IN THE HOME GARDEN

[*Green and Hahn Ltd. photo.*

Superphosphate is a good source of the important element phosphorus, which is especially important in flower, fruit, and seed production and is beneficial in encouraging root growth in young plants.

food requirements of the crop grown, is necessary before a manurial mixture or formula likely to give optimum results can be recommended. Soil analysis alone is usually insufficient; though it is possible to determine accurately the total amount of each element present in the soil, it is very difficult to determine the proportion that is "available" and methods have to be devised to differentiate between available food and that not likely to be of immediate value to the plant.

Though certain crops make especially-heavy demands on certain elements, the use of what is known as a complete fertiliser (one containing nitrogen, phosphorus, and potash), say, on a 1 : 2 : 1 analysis ratio, is practically always justified. Because of difficulties in mixing and applying small quantities of different mixtures to closely-spaced rows of different vegetables, it is frequently impracticable in the home garden to apply complicated manurial mixtures to each crop. Even if such mixtures have given good results when used on a large scale on a fairly-wide range of soils, there is rarely any evidence based on properly-conducted trials to show that the particular formula used will give superior results on any particular range of soils to other and perhaps very different formulas. At least 11 or 12 chemical elements are important in plant nutrition and of these, four are likely to be short in most soils—nitrogen, phosphorus, potassium, and calcium.

Nitrogen is the most important element in plant nutrition. It is concerned mainly with the vegetative (or leafy) growth of the plant. A deficiency is marked by poor growth, lack of dark green, succulent foliage, short, thin, upright shoots, and early defoliation. Its too-liberal use produces a weak constitution, soft, sappy growth, liability to disease, and delay in maturity. The greatest demand for it is usually in spring.

Phosphorus is specially important in flower, fruit, and seed production and is beneficial in encouraging root growth in young plants. It is best dug into the soil before seeding or planting out and it should be a component of most seed composts. An excess hastens ripening and in this respect counteracts excess nitrogen. A deficiency is associated with stunting of roots, particularly the lateral fibrous rootlets, restricted growth, and short, thin, upright shoots. In acute cases small leaves grow at right-angles and finally become bright red, yellow, or purple, and early defoliation occurs. Symptoms in general are very like those of nitrogen deficiency. Department of Agriculture trials indicate that this element is deficient in many New Zealand soils.

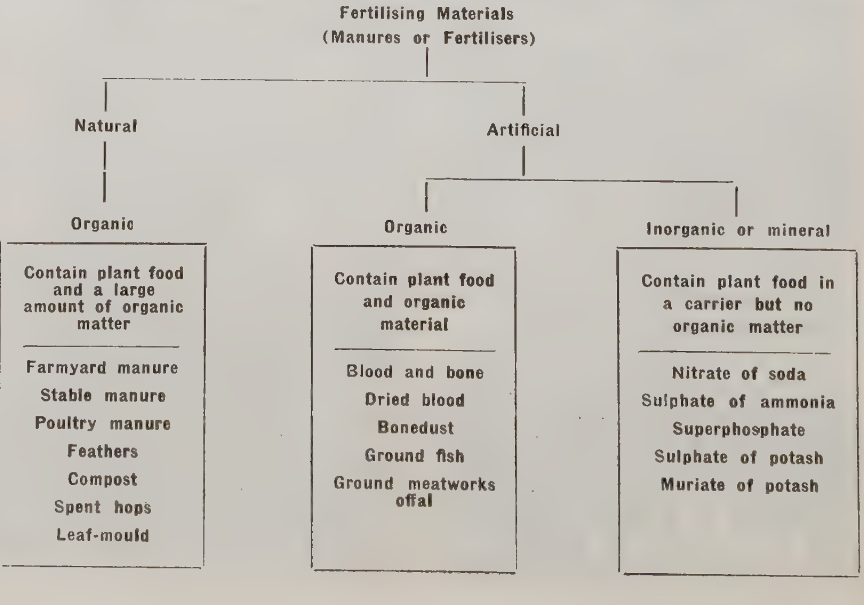
Potash is regarded as important in the general health of the plant in developing sturdiness and disease resistance. It helps to promote the growth of woody tissues and improves texture, colour, and quality. Deficiency symptoms differ somewhat with different plants, but in general they are restricted growth and short internodes; if the deficiency is severe, the symptoms are die-back of lateral growth, bluish-green leaves with intervenal and marginal loss of green colour, or leaf-scorch. Potash has not been proved deficient in many New Zealand soils.

Calcium is supplied by lime, which is used to correct soil acidity. Lime is readily dissolved by the carbonic acid gas brought down by rain-water and is readily leached out of the soil. It releases dormant plant foods in the soil and renders them available and is also necessary as a base to satisfy the requirements of certain artificial fertilisers. Practically all home garden soils in New Zealand are improved by the regular application of lime. Annual dressings of 2 to 4oz. per square yard usually give satisfactory results, but on certain soils, particularly those in high-rainfall districts such as some soils around Auckland, annual dressings of ½lb. per square yard or occasionally even more are not considered excessive.

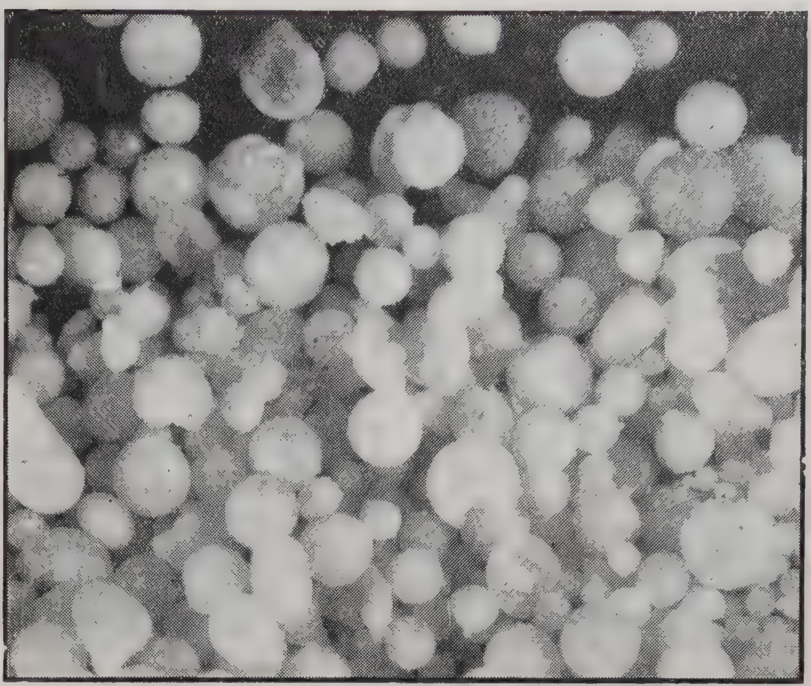
Plant Food Value

Home gardeners often fail to realise that the plant food value of a particular fertiliser or manure depends on the percentage of the active constituent it contains. For example, sulphate of ammonia contains on an average 20.6 per cent. of nitrogen,

CLASSIFICATION OF DIFFERENT KINDS OF FERTILISERS


Fertilising Materials
(Manures or Fertilisers)
Natural
Artificial
Organic
Organic
Inorganic or mineral
Contain plant food and a large amount of organic matter
Farmyard manure
Stable manure
Poultry manure
Feathers
Compost
Spent hops
Leaf-mould
Contain plant food and organic material
Blood and bone
Dried blood
Bonedust
Ground fish
Ground meatworks offal
Contain plant food in a carrier but no organic matter
Nitrate of soda
Sulphate of ammonia
Superphosphate
Sulphate of potash
Muriate of potash

dried blood 12.8 per cent. of nitrogen, and an average sample of farmyard manure about ½ per cent. of nitrogen. The plant requires the nitrogen and does not appear to differentiate between nitrogen from one source or another, whether from the breaking down of dried blood in the soil or industrial synthetic nitrogen. Because materials such as farmyard manure, stable manure, stack bottom, or compost are available in only limited quantities and they can usually supply only a relatively-small amount of the principal plant foods required, they should be supplemented by mineral fertilisers to obtain the best results. The value of such organic material usually lies in its effect on the physical structure of the soil and the fact that it usually supplies trace elements important for plant growth.



[*Green and Hahn Ltd. photo.*

Nitrate of soda is a quick-acting nitrogenous fertiliser which is especially suitable for applying as side dressings for green crops such as spring cabbage, lettuce, and silver beet.

Chemical analysis has shown that the mineral residue or ash of plants may contain as many as 64 different chemical elements. Most are only in trace amounts, but in spite of the fact that plants can be grown quite well in water solutions which contain nitrogen, phosphorus, potassium, calcium, magnesium, and sulphur and the essential trace elements of iron, manganese, boron, zinc, and copper, some people consider that all 64 elements are necessary for normal healthy growth. Farmyard manure and similar organic material are rarely available in the home garden in sufficient quantity to supply the rather heavy demands made by vegetables for the principal plant foods. It is generally accepted, for instance, that the minimum amount for good growth is 50lb. each of nitrogen, phosphorus, and potash per acre. It is important that there is reasonable balance between the three. A chain is no stronger than its weakest link, and a plant's growth may be limited by an insufficiency of one element in spite of an abundance of others. For example, excess nitrogen will not make the plant grow if it lacks phosphorus, or conversely, because it can be seen that nitrogen stimulates growth, it does not mean that the plant will not benefit from phosphorus; it may only mean that the soil contains just enough phosphorus for growth.

The average larger-sized home garden in New Zealand is a little less than 1/16 acre. One-sixteenth of the 50lb. minimum for each of the three principal elements is about 3lb. of each, but as so many New Zealand soils have been shown to be deficient in phosphoric acid, the manurial dressing, or as it is called complete fertiliser, is likely to suit a greater range of conditions if this element is increased. A suitable dressing containing about 3lb. of nitrogen, 5lb. of phosphoric acid, and 3lb. of potash (with an analysis of about 6 : 10 : 6) can be made up by preparing the mixture given in the table below.

A few days before sowing or planting, 1lb. of the mixture should be scattered evenly over each 10 sq. yds. of cultivated soil and raked in. At this rate about 30lb. will be required for a 1/16 acre garden (an area about 60ft. x 50ft. or 90ft. x 30ft.). The remainder can be used to dig in extra dressings to potatoes and tomatoes and to topdress spring cabbage and other green crops when actively growing. The total amount of mixture can be reduced or increased proportionately according to the size of the garden, but the relative amounts of each ingredient should remain the same. The percentage of the active constituent in each fertiliser mentioned above is average, and if fertilisers containing different percentages are used, different weights of ingredients would be necessary to obtain the same analysis. The above will give good results in most gardens, but on a few soils additional nitrogenous fertilisers such as sulphate of ammonia or nitrate of soda may be advisable as topdressing for growing crops. They should be applied as advised below.

Quantity lb.	Fertiliser	Proportion of active constituent	Cost † s. d.
7	Sulphate of ammonia	20.6 per cent. of nitrogen	3 0
21	Blood and bone	6 to 9 per cent. of nitrogen and 10.6 per cent. of phosphoric acid	4 3
14	Superphosphate	20.1 per cent. of phosphoric acid *	1 9
6 —	Sulphate (preferably) or muriate of potash	48 and 50 per cent. respectively of potash	2 0
48			11 0

* If basic or reverted superphosphate is used, the mixture should be made up as required and not stored.

† Prices are 1947-48.

Fertilisers Commonly Sold

Following is a list of fertilisers obtainable from most seedsmen, with some notes on their properties as plant foods. Included are some materials which the home gardener may obtain at home, such as soot and wood ash. The figures in parentheses after each show the average percentage of the active constituent.

Nitrogenous

Sulphate of ammonia (20.6 per cent. of nitrogen; soluble in water) is slower acting than nitrate of soda and is not readily washed out of the soil. It is especially useful where rainfall is high and can be applied in one dressing if thoroughly incorporated in the soil; it should not touch the foliage. It can be mixed with basic or reverted superphosphate if used immediately and also applied with sulphate of potash. It is usually applied at the rate of ½ to ¾oz. per square yard, and if for a topdressing to young plants, preferably in two or three applications at 2- or 3-weekly intervals. If it is used regularly, moderate liming is essential.

FERTILISERS IN THE HOME GARDEN . . .

Nitrate of soda (16 per cent. of nitrogen; soluble in water) is very quick acting and is useful for side dressings for leaf crops such as cabbage, but as it is liable to be washed away, it should be applied in several dressings with intervals between the dressings to prevent loss. It is useful on sour soils and where rainfall is low. On clay soils the soda left assists potassic and phosphoric compounds to become more readily available. It can be applied at the rate of ½ to about 1¼oz. per square yard, but the same precautions in applying it should be observed as advised for sulphate of ammonia. Evenness of distribution is made easier by mixing it with several times its bulk of sand or fine, dry soil.

Both sulphate of ammonia and nitrate of soda can be applied as liquid manure at the rate of ½ to 1oz. to 2 gallons of water.

Dried blood (12.8 per cent. of nitrogen; insoluble in water) should be applied at the rate of up to 8oz. per square yard.

Feathers (about 6 to 8 per cent. of nitrogen; insoluble in water) should be applied several months before planting.

Soot (0.5 to 6 per cent. of nitrogen; insoluble in water) should be 3 to 6 months old before being applied to crops. It is useful as a topdressing in spring and darkens light soils, so making them warmer and earlier. It also improves the texture of strong, clay loams.

Phosphatic

Superphosphate (20.1 per cent. of phosphoric acid; soluble in water) should be applied at the rate of 1 to 3oz. per square yard.

Basic or reverted phosphate (reverted superphosphate) is made up of 85 parts of superphosphate and 15 parts of lime (19 per cent. of phosphoric acid; insoluble in water). Except where a particularly-quick flush of growth is desired, this is preferable to ordinary superphosphate for the home gardener, as it does not damage the bag in which it is stored and is less liable to cause germination injury. Though in a less-soluble form than ordinary superphosphate, it is generally considered less likely to become fixed (rendered unavailable) so readily by the soil. It should be applied at the rate of 1 to 3oz. per square yard.

Steamed bone flour (1.5 to 3 per cent. of nitrogen and 22 to 27 per cent. of phosphoric acid; insoluble in water) is very useful as a drying agent when mixed with other fertilisers and serves to prevent caking. It decomposes readily in certain light soils. It should be applied at the rate of 1 to 3oz. per square yard.

Phospho-nitrogenous

Ammoniated superphosphate (6.4 per cent of nitrogen and 13 per cent. of phosphoric acid; soluble in water) consists of 2 parts of superphosphate and 1 part of sulphate of ammonia. It should be applied at the rate of 1 to 2½oz. per square yard.

Bone meal or bonedust (3.5 per cent. of nitrogen and 22.5 per cent. of phosphoric acid; insoluble in water) should be applied at the rate of 1½ to 3oz. per square yard.

Blood and bone (6.9 per cent. of nitrogen and 10.6 per cent. of phosphoric acid; insoluble in water) should be applied at the rate of 1½ to 3oz. per square yard and more rarely up to 8oz. per square yard.

Bone manures act best on soils deficient in lime or on soils rich in organic matter.

Potassic

Sulphate of potash (48.6 per cent. of potash; soluble in water) should be applied at the rate of 1/3 to 1oz. per square yard.

APPROXIMATE AVERAGE COMPOSITION OF FRESH MANURE FROM VARIOUS ANIMALS

Animal	Relative proportion of solid excrement, liquid excrement, and bedding in manure	lb. per short ton	Nitrogen		Phosphoric acid		Potash	
			Per cent.	lb.	Per cent.	lb.	Per cent.	lb.
Horse	Solid excreta ..	1200	1.53	6.60	0.36	3.60	0.40	4.80
	Liquid excreta ..	300	1.35	4.05	Trace		1.25	3.75
	Bedding material	500	0.50	2.50	0.15	0.75	0.60	3.00
	Total mixture	2000	0.66	13.15	0.22	4.35	0.58	11.55
Cow	Solid excreta ..	1260	0.40	5.04	0.20	2.52	0.10	1.26
	Liquid excreta ..	540	1.00	5.40	Trace		1.35	7.29
	Bedding material	200	0.50	1.00	0.15	0.30	0.60	1.20
	Total mixture	2000	0.57	11.44	0.14	2.82	0.49	9.75
Pig	Solid excreta ..	990	0.55	5.44	0.50	4.95	0.40	3.96
	Liquid excreta ..	660	0.60	3.96	0.10	0.66	0.45	2.97
	Bedding material	350	0.50	1.75	0.15	0.42	0.60	2.10
	Total mixture	2000	0.56	11.15	0.30	6.03	0.45	9.03
Sheep	Solid excreta ..	1206	0.75	9.04	0.50	6.03	0.45	5.43
	Liquid excreta ..	594	1.35	8.02	0.05	0.30	2.10	12.47
	Bedding material	200	0.50	1.00	0.15	0.30	0.60	1.20
	Total mixture	2000	0.90	18.06	0.33	6.63	0.95	19.10
Poultry	Solid excreta ..	1900	1.00	19.00	0.80	15.20	0.40	7.60
	Bedding material	100	0.50	0.50	0.15	0.15	0.60	0.60
	Total mixture	2000	0.97	19.50	0.77	15.35	0.41	8.20

Muriate of potash (50 per cent. of potash; soluble in water) should be applied at the same rate as sulphate of potash.

Sulphate of potash is preferred on heavy soils and under glass and for tobacco, tomato, potato, and certain other crops.

Wood ash (1 to 10 per cent. of potash).

Many seaweeds are good sources of potash, but in general seaweeds are of value in the home garden chiefly as sources of organic matter.

Natural Manures

In the limited quantity usually available to the home gardener such material as farmyard, stable, or poultry manure is of value chiefly for its organic content. Its plant food value depends greatly on method of storage and to some extent the food the animals received, but it is usually relatively low in phosphoric acid and it is advisable to supplement it with superphosphate to preserve a better balance of plant nutrients. The table below prepared by Dr. F. T. Shutt and published in Bulletin 388 of the Ontario Department of Agriculture shows the plant food value of the commoner animal manures in pounds and percentage of the active constituents per short ton.

A ton of well-rotted manure contains more plant food than fresh manure, as shown in the following table also prepared by Dr. Shutt:—

	Pounds per ton		
	Nitrogen	Phosphoric acid	Potash
Fresh manure ..	7.5	3.6	9.0
Rotted manure ..	10.3	8.5	15.9

Application of Fertilisers

Plants can absorb nutrients only as they become soluble. When in this condition they are dissolved in soil water and are taken into the plant's system by the process known as osmosis. Solubility is brought about very gradually by acid exuded by the root hairs, the carbonic acid contained in soil water, the action of the atmosphere, and the bacteria in the soil. The organic materials are slow acting; the nitrogen in dried blood, for example, requires to be decomposed in the soil before it is available as plant food.

The following points are important in applying fertilisers:—

Fertilisers that are readily soluble should be scattered over the soil in limited amounts as required and raked in; rain will wash them through the soil. The so-called insoluble fertilisers are only slowly soluble and are best worked well in so that the soil constituents can immediately begin to act on them. They are usually best applied to plants which occupy the ground for a long time. Evenness of spreading is very important and can be greatly facilitated by mixing with dry soil, sand, or fine ashes. Adequate moisture is essential for dissolving the plant food and enabling the plant to absorb it. On loose, open, sandy soils when rainfall is high, insoluble fertilisers are usually preferable so that loss through heavy rain is minimised.

A "FARM HAND" FOR THE ASKING

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Take care of your farm implements

Just a little extra care to your implements and machinery will give you greater efficiency and lower maintenance costs—and it takes only a few minutes.

At the end of the day, for instance, rub over all shiny surfaces with an oily rag, and oil all moving parts.

Before storing equipment, make sure it is thoroughly cleaned and defective parts replaced. Then treat all shiny surfaces with a rust-preventing compound, oil all moving parts, and apply a coat of paint where necessary. Heavy machinery, such as harvesters, should be given a complete overhaul.

Always store your implements under shelter, and protect them with covers from dust, birds and livestock.

That extra care to your implements NOW will make your work easier and avoid break-downs later when every hour counts.

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BETTER FARM MANAGEMENT

means more production

WHERE BRITAIN STANDS WE STAND

ISSUED BY THE AID FOR BRITAIN NATIONAL COUNCIL

BT.16.24

"Floating" Post for a Wide Gateway

By F. G. FERGUSON, Fields Instructor,
Department of Agriculture, Christchurch.

WITH the application of mechanisation to agriculture the farmer has been confronted with many problems, and during the period of transition from horse-drawn to tractor-drawn implements it has been necessary to alter methods of cultivation and to overcome problems concerned with draught, traction, and speed. Though today the technique of handling mechanical equipment has reached an advanced stage, there are many properties on which machinery is used extensively where more efficient use of equipment is still possible. A common sight on many farms is a gate barely wide enough for the passage of implements such as disc harrows, Cambridge roller, or header harvester, and each time the gate is used the tractor operator is faced with a severe test of skill and patience. Gateposts are often damaged, entailing frequent repairs or replacements, which at today's prices mean considerable expense.

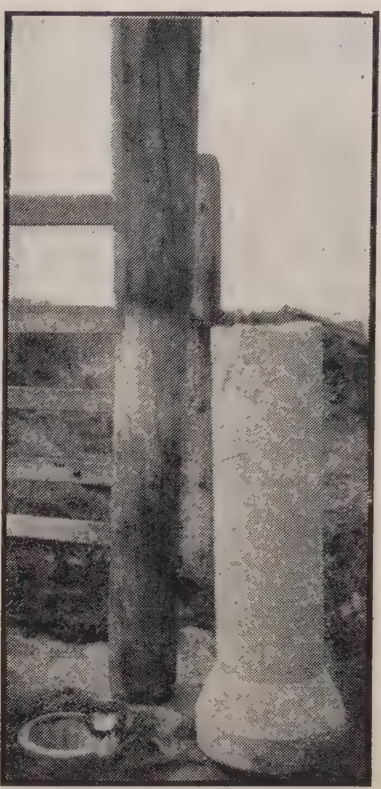
A FARMER in the Leeston district has overcome this difficulty by making use of what may be termed a "floating" post. Originally the gates on his farm were the usual 12ft., or just wide enough to allow cumbersome implements to pass through with care. The gates were constructed of heavy hardwood, they warped easily, and stress was placed on stays, posts, and hinges each time they were used, which tended to make the opening and shutting of the gates tedious work.

To rectify the position the farmer first removed one post in a gateway and repaired or replaced the remaining post, whichever was necessary. The battens on the gate were tightened up and straightened or replaced, the hinges attended to, and anything else done which would ensure that the gate swung freely and was easily operated.

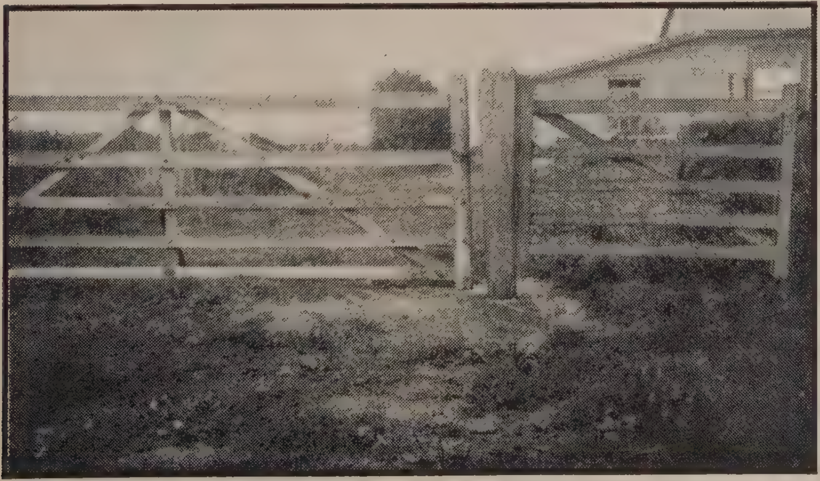
Damaged Pipe Used

The next step was to sink an 8in. concrete drainpipe to ground level in place of the gatepost removed. The pipes used, which were purchased from a local firm of concrete pipe manufacturers, were slightly damaged and so unserviceable for drainage work. The firm was only too pleased to dispose of the reject materials at a low price.

When the drainpipe had been installed a small gate was swung on a post erected on the line of the remaining gatepost and the drainpipe, but beyond the latter. (The dimensions of the small gate are optional, but upon its width depends the ultimate width of the whole gateway.) The next operation was to select a post approximately the size of the sunken drainpipe—a post a little larger than the pipe is best because it can be trimmed to fit so that the post can be lifted out easily, yet is not likely to be dislodged. After the post had been fitted into the pipe suitable fastenings were made and both gates fastened to the floating post. The gates used by the Leeston farmer were 12ft. 6in. and 5ft. 6in. wide respectively, giving an overall gateway of 18ft.—ample space to accommodate any implement or machine.



The post showing how it is trimmed to fit the pipe.



The completed gateway with both gates swung in position.

To prevent water running down the post and into the sunken pipe, flashing may be attached to the post at ground level.

Many Advantages

The advantages of the floating post are manifold. To make a gateway sufficiently wide for a Cambridge roller or header harvester the operator has only to open both gates and lift out the floating post. This can be done in a moment, with a minimum of effort, and damage to gateposts or machines is avoided. Where a short turn is necessary, such as at an entrance to or exit from a farmyard, the floating-post arrangement is excellent. In addition it saves time and there is a smaller outlay for repairs and replacements to gates and posts.

The small gate, which can be made big enough to allow a wheelbarrow through, is very convenient and makes it unnecessary for a person using a gateway to open a wide, heavy gate.

The installation of a floating-post gateway is inexpensive; it can be done at any odd period when the farmer is not so busy; and it gives a neat appearance to a property.

LAMBING ESTIMATES FOR 1948

Dominion Percentage Second Highest on Record

By the Livestock Division.

THE estimated lambing percentage of the Dominion for the 1948 season is 92.72, which is the second highest on record and is only .39 below the record figure of 93.11 for 1947. The previous best figure was that for 1945, when the estimated percentage was 92.64.

The percentage estimate for the South Island is, as usual, higher than that for the North Island, but the difference this season is greater than normal, 96.93 being recorded for the South Island and 89.43 for the North Island, a difference of 7.50. The North Island percentage has fallen by 3.04 from 92.47 in 1947, but the percentage for the South Island has increased by 2.99 from 93.94.

County	Breeding ewes (as at 1948)	Estimated percentage of lambs	Estimated number of lambs
AUCKLAND DISTRICT			
Mangonui	29,836	86.20	25,719
Whangaroa	14,648	81.90	11,997
Bay of Islands	64,766	88.10	57,059
Hokianga	44,584	78.72	35,097
Whangarei	89,576	86.81	77,761
Otamatea	75,696	85.34	64,599
Hobson	79,176	85.32	67,553
Rodney	92,892	86.20	80,073
Great Barrier	5,715	64.53	3,688
Waitemata	70,316	86.69	60,957
Eden	2,267	85.27	1,933
Manukau	65,732	89.10	58,567
Franklin	117,702	94.10	110,758
Coromandel	32,058	88.02	28,217
Thames	10,645	84.17	8,960
Hauraki Plains	15,037	93.11	14,001
Ohinemuri	18,872	94.64	17,860
Waikato	158,239	91.64	145,010
Raglan	433,769	91.24	395,771
Waipa	186,426	94.18	175,576
Piako	125,534	85.48	107,306
Matamata	276,501	95.60	264,335
Rotorua	101,869	96.70	98,507
Taupo	28,769	94.60	27,215
Taumarunui	114,153	91.00	103,879
Kawhia	68,450	92.28	63,166
Otorohanga	149,754	94.00	140,769
Waitomo	363,363	86.12	312,928
Ohura	115,810	88.00	101,913
Kaitieke	66,865	90.60	60,580
Tauranga	150,430	95.80	144,112
Whakatane	51,164	90.00	46,048
Opotiki	47,413	74.00	35,086
Totals	3,268,027	90.18	2,947,000

County	Breeding ewes (as at 1948)	Estimated percentage of lambs	Estimated number of lambs
EAST COAST-HAWKE'S BAY DISTRICT			
Matakaoa	60,889	83.00	50,538
Waiapu	240,671	82.00	197,350
Uawa	119,436	80.00	95,549
Cook	420,978	84.00	353,622
Waikohu	347,509	84.00	291,908
Wairoa	404,286	80.81	326,704
Hawke's Bay	928,227	86.07	798,925
Waipawa	418,791	93.76	392,658
Waipukurau	132,211	92.57	122,388
Patangata	495,534	88.38	437,953
Weber	52,352	82.35	43,112
Dannevirke	276,723	92.55	256,107
Woodville	83,951	92.15	77,361
Pahiatua	154,823	90.18	139,619
Akitio	158,163	80.55	127,400
Totals	4,294,544	86.42	3,711,194
WEST COAST-WELLINGTON DISTRICT			
Clifton	89,401	90.87	81,239
Taranaki	29,141	97.21	28,328
Inglewood	48,733	90.21	43,962
Egmont	18,816	96.61	18,178
Stratford	105,286	93.08	98,000
Whangamomona	56,625	87.96	49,807
Eltham	52,547	96.69	50,808
Hawera	69,946	99.73	69,757
Waimate West	5,778	98.98	5,719
Patea	206,343	95.95	197,986
Waitotara	136,177	90.77	123,608
Waimarino	163,237	88.00	143,649
Wanganui	269,726	83.35	224,817
Rangitikei	957,631	96.00	919,326
Oroua	194,125	95.49	185,370
Kairanga	106,565	96.50	102,835
Kiwitea	228,044	95.03	216,710
Pohangina	125,131	93.61	117,135
Manawatu	137,665	98.60	135,738
Horowhenua	117,741	96.02	113,055
Hutt	64,946	76.12	49,437
Makara	45,628	79.94	36,475
Featherston	311,233	90.00	280,110
Wairarapa South	171,448	91.00	156,018
Masterton	279,089	86.30	240,854
Castlepoint	89,625	85.40	76,540
Eketahuna	131,917	82.10	108,304
Mauriceville	46,481	87.10	40,485
Totals	4,259,025	91.90	3,914,250

LAMBING ESTIMATES FOR 1948

County	Breeding ewes (as at 1948)	Estimated percentage of lambs	Estimated number of lambs
MARLBOROUGH-NELSON-WESTLAND DISTRICT			
Waimea	168,762	85.0	143,448
Takaka	27,932	83.0	23,184
Collingwood ..	14,710	80.0	11,768
Buller	1,372	90.7	1,244
Inangahua	13,356	101.4	13,543
Murchison	27,397	89.4	24,493
Grey	22,871	116.0	26,530
Westland	33,472	113.5	37,991
Sounds	97,467	75.8	73,880
Marlborough ..	204,608	88.3	180,669
Awatere	165,617	88.0	145,743
Totals	777,564	87.77	682,493
CANTERBURY-KAIKOURA DISTRICT			
Kaikoura	129,838	85.3	110,752
Amuri	215,081	84.0	180,668
Cheviot	142,657	98.5	140,517
Waipara	286,714	98.0	280,980
Ashley	56,829	91.0	51,714
Kowai	73,413	100.0	73,413
Oxford	68,356	91.0	62,204
Rangiora	42,967	107.5	46,190
Eyre	52,212	106.0	55,345
Tawera	51,098	87.0	44,455
Malvern	130,428	103.4	134,863
Paparua	37,104	107.5	39,887
Waimairi	3,761	98.0	3,686
Heathcote	7,060	98.0	6,919
Akaroa	84,905	113.0	95,943
Mount Herbert ..	37,716	104.0	39,225
Wairewa	69,504	111.0	77,149
Halswell	15,028	101.0	15,178
Springs	32,930	106.0	34,906
Ellesmere	78,616	113.0	88,836
Selwyn	143,233	84.8	121,462
Ashburton	746,630	88.7	662,261
Geraldine	245,127	96.0	235,322
Levels	171,228	104.0	178,077
Mackenzie	285,369	82.6	235,715
Waimate	470,067	88.7	416,949
Chatham **Islands** ..	44,383	73.0	32,400
Totals	3,722,254	93.09	3,465,016

Loans for Building Sow Accommodation

ON the grounds that pig breeding, as distinct from pig fattening, is mainly the work of the small farmer in New Zealand, the Government has decided to make loan assistance available to farmers for the building of extra sow accommodation or the renewal of units which have become obsolete. It is hoped thereby to aid the production of pig meats by encouraging the small pig raiser to carry more breeding sows.

Loans of up to £50 will be granted for each unit built or improved, with a limit of £100. Each loan will be subject to the approval of the secretary of the local branch of Federated Farmers and the supervisor of the local district pig council, by whom the plans must be approved and the work inspected.

Loans will be made through one of two channels: Through the State Advances Corporation, if the farm is already indebted to the Corporation, which will take additional security if necessary and charge interest at its normal rate for such loans; in all other cases through the Bank of New Zealand by overdraft secured on the property, carrying interest at the normal overdraft rate and Government guaranteed if necessary. Regular repayments will be arranged by means of factor orders.

OTAGO-SOUTHLAND DISTRICT

District	Breeding ewes (as at 1948)	Estimated percentage of lambs	Estimated number of lambs
Waitaki	450,602	97.0	437,084
Maniototo	237,160	94.0	222,930
Vincent	236,086	94.0	221,921
Waihemo	98,427	91.0	89,569
Waikouaiti	72,763	95.0	69,125
Taieri	165,596	90.0	149,036
Peninsula	15,328	101.0	15,481
Clutha	424,738	102.0	433,233
Tuapeka	335,212	93.0	311,747
Bruce	217,691	95.0	206,806
Lake	113,329	85.0	96,330
Southland	1,768,025	110.0	1,944,828
Wallace	596,736	101.0	602,703
Stewart Island ..	2,375	80.0	1,900
Totals	4,734,068	101.45	4,802,693

DISTRICT ESTIMATES

The following table gives the estimates of the current (1948) season's lambing for each sheep district:—

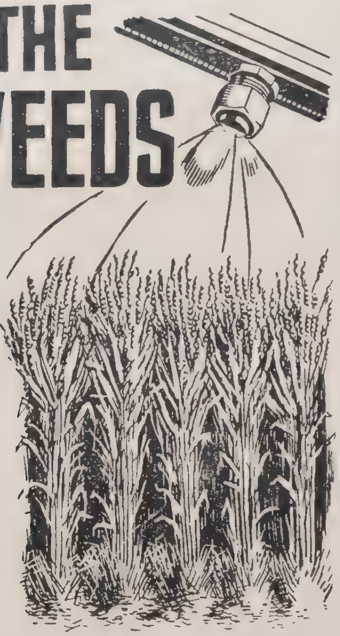
Auckland	3,268,027	90.18	2,947,000
East Coast-Hawke's Bay	4,294,544	86.42	3,711,194
West Coast-Wellington	4,259,025	91.90	3,914,250
Marlborough-Nelson-Westland ..	777,564	87.77	682,493
Canterbury-Kaikoura	3,722,254	93.09	3,465,016
Otago-Southland ..	4,734,068	101.45	4,802,693
Dominion ..	21,055,482	92.72	19,522,646

Dominion Totals

The following table shows the estimated lambing for the North and South Islands for the previous five years together with the actual number of lambs tailed:—

Year	Number of breeding ewes (*as at 1941) (†as at 1945)	Estimated percentage of lambs	Estimated number of lambs	Actual No. of lambs tailed
NORTH ISLAND				
1948 ..	11,821,596	89.43	10,572,444	—
1947 ..	11,696,313	92.47	10,814,554	11,250,554
1946 ..	†11,890,011	87.92	10,453,719	10,447,857
1945 ..	11,890,011	92.56	11,004,903	11,252,679
1944 ..	11,740,920	90.08	10,576,495	11,054,223
1943 ..	*11,268,384	87.18	9,823,748	10,654,244
SOUTH ISLAND				
1948 ..	9,233,886	96.93	8,950,202	—
1947 ..	9,047,469	93.94	8,498,971	8,584,492
1946 ..	†8,975,847	91.69	8,229,713	8,194,441
1945 ..	8,975,847	92.75	8,324,990	8,308,779
1944 ..	8,808,796	94.07	8,286,568	8,399,083
1943 ..	*8,762,549	89.16	7,813,548	7,767,692
DOMINION				
1948 ..	21,055,482	92.72	19,522,646	—
1947 ..	20,743,782	93.11	19,313,525	19,835,046
1946 ..	†20,865,858	89.54	18,683,432	18,642,298
1945 ..	20,865,858	92.64	19,329,893	19,561,458
1944 ..	20,549,716	91.79	18,863,063	19,453,306
1943 ..	*20,030,933	88.05	17,637,296	18,421,936

SPRAY THE WEEDS



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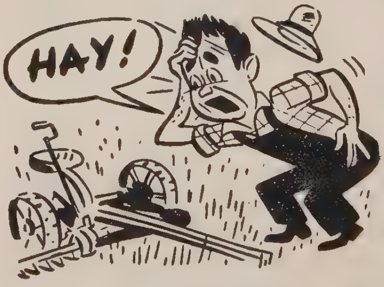

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Household Poultry: Hens or Pullets for Egg Production?—Culling Non-Productive Hens—Cleaning Housing for the New Season

IN any business the excess of income over expenditure indicates the extent of its success. That applies to poultry keeping, whether in a large or a small way. The householder should never treat the effort purely as a hobby nor the birds as mere pets, but should take a pride in the hens and keep records to show the benefits and income they produce.

A laying shed suitable for housing up to 15 birds where an outside run is provided.

WITH the growing tendency for sections in towns and cities to be subdivided into smaller units, and with the increase in the number of State houses, the number of householders keeping poultry might be expected to diminish, but, except in the chief cities, there is little evidence that "backyard" poultry keeping is declining. As with all hobbies—and that is the outlook of many toward hens, even though they can show a good financial return—newcomers are constantly entering the ranks and old hands drop out. What recent evidence is available shows that the popularity of household poultry keeping has increased during the past 3 years. Figures cannot be quoted because units of fewer than 25 laying birds need not be registered under the Poultry Runs Registration Act. Evidence of increased sales by hatcheries can be accepted, and they prove this statement.

In addition, the number of oral and written inquiries received by the Department of Agriculture has increased vastly of late. The instructional and advisory services of Poultry Instructors are available to all.

In very few cases is a property too small to permit a few fowls being kept, but individual circumstances should be permitted to influence the poultry-keeping system and the number kept.

These hints on household hens are not intended to cover subjects exhaustively but to discuss subjects topical for the current month; to give the average householder working ideas of suitable, simple, poultry-maintenance systems; to show the difference between good and poor methods; and, above all, to encourage the householder who tries to solve the winter egg shortage. Space may not permit a full description of a subject about which the reader wants more information, but several free bulletins and a few costing 6d. each on poultry subjects are obtainable at all major branch offices of the Department of Agriculture.

Hens or Pullets for Egg Production?

A householder usually does not have more than one poultry house or pen, yet many recognise as correct the statement that hens and pullets should not be run together. A common practice is to buy half-a-dozen pullets each year and to run them with the survivors of the previous season's hens. Often the only culling is that done by natural mortality. The introduction of replacement stock in the form of nearly-mature pullets about February or March at about 5 to 6 months of age, just as they are near the point of laying, is not so bad, but to keep down the cost of replacement stock most people buy them as perching pullets 6 or 8 weeks old, thenceforth running them with the hens. At this stage the young pullets have not developed their full natural resistance to disease, and the chances of their catching complaints from the hens is increased greatly. If the hens are infested with body lice or intestinal worms, for example, the pullets are certain to contract them.

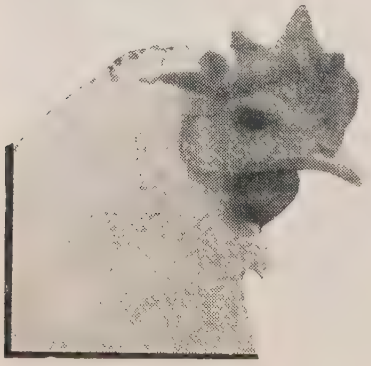
THIS is the first of a series of articles by W. L. McIver, Poultry Instructor, Department of Agriculture, Dunedin, for householders who keep a relatively-small number of hens and whose chief interest is a supply of fresh eggs for the household or, at most, some small supplement to the family income. It must be assumed that the reader has some knowledge of poultry, but it is intended to avoid being technical or scientific as far as possible. The articles for the commercial poultry farmer which appear frequently in the "Journal" should also be within the scope of interest of most keepers of small poultry units.

Further, running pullets and hens together is on a par with making infants in the primers and children from the senior standards play together in the same school ground. Hens are like children in that some feel they must exercise their superior size and strength; others will even come to knocks and blows, and a few behave like outlaws and savages. The weaker and timid birds are bullied by all. Only the strongest—not necessarily the largest—are free from bullying. This disparity in temperament is frequently the cause of toe or vent picking. Hens are also creatures of habit and have their favourite nests and positions on the perch at night.

Disparities in ages, sizes, and temperaments will reduce egg production. The better the birds get on together, the higher will be the egg yield. Timid pullets, bullied by flock mates, will not get sufficient to eat and, consequently, will lay fewer eggs. One helpful factor is to run together only birds of the same age, and another is to cull out all weak, timid pullets. Consequently, if there is only one fowlhouse, all the stock should be replaced at one time and all the old birds quitted together.

Some achieve this object by buying pullets every second year, but this method has grave disadvantages. First, if the pen was not overstocked in the pullet year, it will certainly be understocked in the second (or hen) year. Some deaths are almost certain, and usually not more than 60 per cent. of the pullets are good enough layers to be retained for another year. Understocking the housing is not economic and reduces the labour by very little. Second, no bird lays as many eggs in her second year as she did in her first, and the number falls each subsequent year. Third, pullets hatched in the correct months will lay right through the winter when eggs are scarce and prices high; the yearling hen will be in moult at the beginning of winter and will not lay for about 3 months.

The conclusion must be reached that the replacement of all the birds with pullets every year is a paying proposition. The old hens have a good value at the mart or for home consumption, and they should be sold or eaten and their sale value used toward paying for the new pullets.



[*Jack Welsh and Sons photo.*

The weak type of head and sunken eye of a poorly-producing bird.

Culling Non-productive Hens

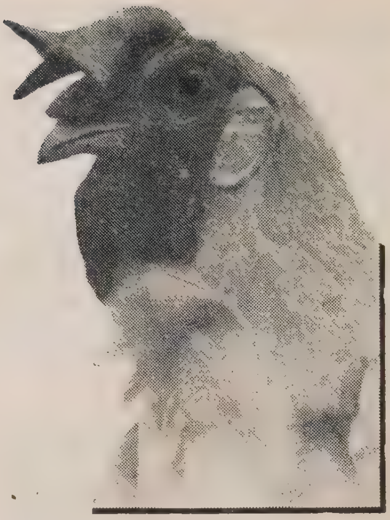
If replacement pullets have been bought while they are still young, they should be accommodated in temporary quarters until the laying house is emptied. A shelter more or less of a makeshift type will do for the growing pullets; what they need is mainly shelter at night and shade during the day.

Most of the hens should still be laying in January and February, and the new pullets hatched in the later months probably will not begin to lay until about March. This does not infer that all the hens should be retained until March, as some birds will continue laying for longer than others. As soon as a hen has stopped laying it should be culled out. The uneconomic hen can be judged by its comb and pelvic bones. Details of culling will be covered in a subsequent article.

The non-laying hen eats nearly as much as the producer, so it should be killed promptly for consumption.

Cleaning out for the New Season

Not only should the old birds be cleared out to make way for the pullets, but also the housing should be thoroughly cleaned for the new occupants. When the pullets "redden up" it is a sign that the balance of the hens must be quitted. That should not be left until the last moment, but sufficient time should be allowed for taking out all the old litter; hosing down walls and ceiling and permitting them to dry; creosoting walls, perches, nest boxes, and fittings and allowing to dry, before putting the pullets in the house. Drinkers, troughs, and hoppers should be cleaned properly.



The rugged but fine head of a heavily-producing bird, with clean face and bold eye.

Fresh, clean floor litter should then be put in. If straw is used, start with about 3in. of litter and, as the birds break it down, keep adding small quantities so that it is 6 to 8in. deep by the time the wet winter weather sets in. That increases the chance of the litter remaining dry through the winter and in the long run is cheaper than putting in a shallow depth and changing it frequently. Cleanliness is an insurance against disease.

* * *

SHOW DATES

THE following are dates and venues of A. and P. shows up to the end of March.

February 1 and 2—Feilding I. A. and P. at Feilding.

February 3 and 4—Feilding Ram Fair at Feilding.

February 5—Clevedon A. and P. at Clevedon.

February 5—Rodney Agricultural Society at Warkworth.

February 5—Woodville A. and P. at Woodville.

February 5—Golden Bay A. and P. at Takaka.

February 5—Hukerenui A. and P. at Hukerenui.

February 8 and 9—Dannevirke District A. and P. at Dannevirke.

February 10—Dannevirke Ram Fair at Dannevirke.

February 11 and 12—Taranaki A. and P. at New Plymouth.

February 11 and 12—Auckland A. and P. at Auckland.

February 11 and 12—Rangitikei A. and P. at Taihape.

February 12—Northern Wairoa A. and P. at Mititai.

February 12—Murchison A. and P. at Murchison.

February 12—Katikati A. and P. at Katikati.

February 12—Pahiatua A. and P. at Pahiatua.

February 16—Putaruru District A. and P. at Putaruru.

February 16—Opotiki A. and P. at Opotiki.

February 18 and 19—Ohura A. P. H. and I. at Nihoniho.

February 18 and 19—Masterton A. and P. at Masterton.

February 18 and 19—Franklin A. and P. at Pukekohe.

February 18 and 19—Buller A. and P. at Westport.

February 19—North Kaipara Agricultural Association at Paparoa.

February 19—Whakatane and Rangitaiki A. and P. at Whakatane.

February 23—Te Awamutu A. P. and H. at Te Awamutu.

February 26—Waitemata A. and P. at Waiwera.

February 26—Te Puke A. and P. at Te Puke.

February 26—Waiapu P. and I. at Ruatoria.

February 26—Waimarino A. P. H. and I. at Raetihi.

March 1—Otorohanga A. and P. at Otorohanga.

March 5—Albany A. and P. at Albany.

March 5—Matamata A. and P. at Matamata.

March 5—Waiotira Junction Show Association at Waiotira.

March 5—Mangonui County A. and P. at Kaitaia.

March 5—Temuka and Geraldine A. and P. at Winchester.

March 5—Maniototo A. and P. at Ranfurly.

March 9—Morrinsville A. and P. at Morrinsville.

March 11 and 12—Whangarei A. and P. at Whangarei.

March 11 and 12—Waikato Central Agricultural Association at Cambridge.

March 12—Kumeu District A. and H. at Kumeu.

March 12—Hawke's Bay A. and P. at Hastings.

March 12—Cheviot A. and P. at Cheviot.

March 12—Mt. Benger A. and P. at Roxburgh.

March 15—Lake County A. and P. at Arrowtown.

March 19—Poverty Bay A. and P. at Gisborne.

March 19—Mayfield A. and P. at Mayfield.

March 19—Upper Clutha A. and P. at Wanaka.

March 19—Wellsford A. and P. at Wellsford.

March 26—Methven A. and P. at Methven.

March 26—Hawarden A. and P. at Hawarden.

Propagation the Key to Success in the Flower Garden

THE gardener whose borders are always full of plants, a high proportion of them perennial, obtains the best displays of colour with the least trouble from weeds, and with a great saving of time and expense in regular bedding out of annuals. The borders in even a large section can soon be filled with a wide variety of plants raised at home from cuttings, specially if a cold frame is available, but before propagating the gardener should make sure that the parent plants are really good and worth increasing. Propagation is the key to garden success and is the main theme of this month's notes by J. P. Hudson, formerly of the Horticulture Division, Department of Agriculture, Wellington.

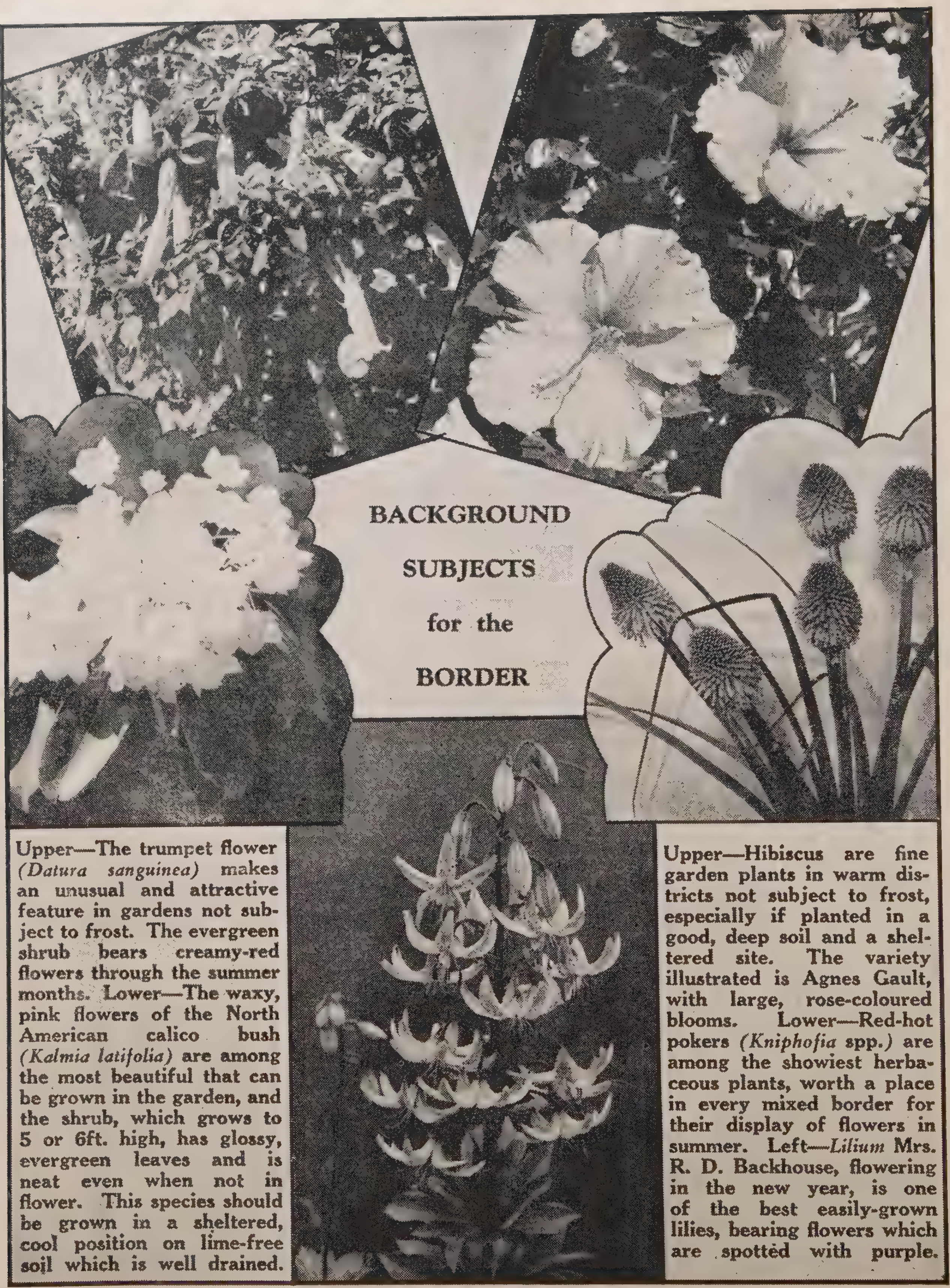
BULB bowls should now be planted up to provide flowers in late winter and early spring. Tulips, hyacinths, and narcissi are all very suitable for growing in bowls. If the bowls are not provided with drainage holes, bulbs should be grown in bulb fibre (obtainable from most seedsmen); ordinary potting compost is quite suitable for bulbs to be grown in plant pots. Tulip bulbs should be planted with their noses level with the surface of the soil, but hyacinth and narcissus bulbs need be only partly covered with soil. In each case the fibre or compost should be packed tightly between and under the bulbs. Fibre should always be soaked overnight in a bucket of water before it is used and the surplus water squeezed out before it is put in the bowls. If dry fibre is used for potting bulbs, it is most difficult to wet it properly afterward. After potting, put the bowls or pots in the coolest part of the garden, either buried to their rims or standing on the surface, and, after watering, cover them with old ashes, soil, or sacks to keep the pots cool and moist.

Bulb-planting time begins in late February, especially in the far southern districts, when a wide range of spring-flowering bulbs can be planted in mixed flower borders. Elsewhere it is best to defer planting most bulbs until March, but the sooner they are bought in the better—before the best bulbs have all been sold. The early-flowering narcissi such as Paper White and Soleil d'Or, together with anemones and ranunculuses, should be planted as soon as bulbs are available and without unnecessary delay.

Catmint (*Nepeta mussinii*) is a grand plant for edging paths, especially where they are bounded by a concrete kerb, the hard line of which can be softened by the use of a row of catmint planted 8in. apart and an inch or two inside the kerb. To keep catmint tidy it should be cut over once or twice during summer, stems which have already flowered being removed. As the new shoots grow up from the centre of the plants, the correct way to trim them is to raise the flowering shoots of each plant, cut off those underneath which have finished flowering, then allow the flowering shoots to fall back into place.

HEADING PHOTOGRAPH: A cheerful garden, always with a show of flowers, where careful use of a few shrubs and trees makes the garden look larger than it is yet need little maintenance.

BACKGROUND SUBJECTS for the BORDER

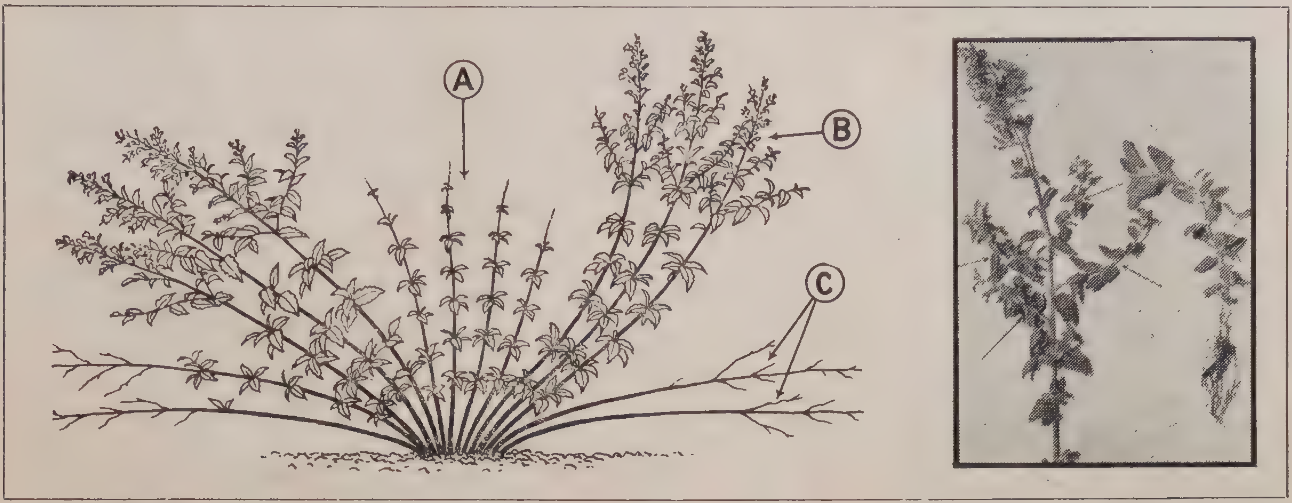


Upper—The trumpet flower *(Datura sanguinea)* makes an unusual and attractive feature in gardens not subject to frost. The evergreen shrub bears creamy-red flowers through the summer months. Lower—The waxy, pink flowers of the North American calico bush *(Kalmia latifolia)* are among the most beautiful that can be grown in the garden, and the shrub, which grows to 5 or 6ft. high, has glossy, evergreen leaves and is neat even when not in flower. This species should be grown in a sheltered, cool position on lime-free soil which is well drained.

Upper—Hibiscus are fine garden plants in warm districts not subject to frost, especially if planted in a good, deep soil and a sheltered site. The variety illustrated is Agnes Gault, with large, rose-coloured blooms. Lower—Red-hot pokers *(Kniphofia* spp.*)* are among the showiest herbaceous plants, worth a place in every mixed border for their display of flowers in summer. Left—*Lilium* Mrs. R. D. Backhouse, flowering in the new year, is one of the best easily-grown lilies, bearing flowers which are spotted with purple.

[All photographs, except that at middle left, by Douglas Elliott.

PROPAGATION AND TRIMMING OF CATMINT BUSHES



Catmint, a fine edging plant that is showy for months every year, can be propagated readily from cuttings. These are taken by pulling out non-flowering side shoots a few inches long (indicated by arrows in the illustration on the right), removing the lower leaves, and inserting the cuttings 1in. deep in a frame or sheltered, shady place. Within a few weeks the cuttings will root and be ready to be planted out, as is the plant on the right. New shoots (A in the diagram) grow from the centre of a catmint bush, while the oldest ones lie on the outside. To trim a bush, lift the flowering shoots (B) with one hand, remove those which have finished flowering (C), and let the flowering shoots drop back into place.

Chrysanthemums growing in pots outdoors to be taken into the house later in the year should be making strong growth, which should be tied to thin bamboo canes. Canes and growth make the pots top-heavy and likely to be blown over in a breeze. That can be overcome by sinking the pots in the soil or, preferably, stretching a wire along each row of pots and tying the canes to the wire.

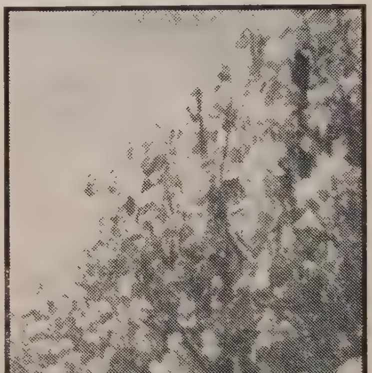
Diaries can be of the greatest help to gardeners, who should jot down in summer the names of species and varieties of plants which are outstanding and then remember to order them from the nurseryman. If full advantage is to be taken—as it should be—of the many plants which can be propagated easily at home from cuttings and layers, it is essential that the stock plants from which the cuttings are taken be of the best varieties available. Increasing varieties that are not really worth growing is pointless.

Money spent on really good varieties of perennial plants represents an investment that can soon be multiplied manyfold by the home gardener with "green fingers," and a cold frame, however crude and simple, greatly increases the range of plants which can be propagated at home.

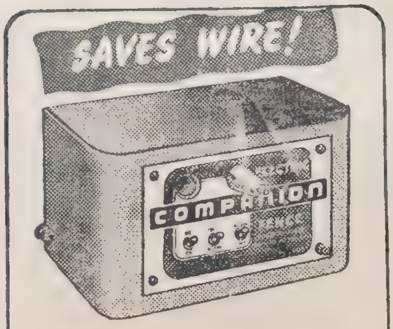
Dahlias are often attacked in summer by thrips and red spider. Thrips are small, active, cigar-shaped insects that feed on the sap and leave the foliage with a scurfy appearance; the spiders are very small, cream-coloured creatures that live on the underneath surfaces of leaves, piercing the surfaces and sucking out sap, which soon causes the leaves to look bronzed and unhealthy. Both pests can be controlled by spraying with the nicotine and summer (white) oil mixture often recommended in these notes. Plants should also be scrutinised in summer for signs of spotted wilt virus disease, which causes pale, wavy "watermarking" of the leaves. This disease does not necessarily kill dahlias but very much reduces the number of flowers they bear late in the season, when the weather is hot and dry. Plants with spotted wilt should be ruthlessly dug up and burnt as soon as the symptoms are noticed, but if this will spoil the appearance of a border, they should at least be marked carefully and dug up and burnt at the end of the season. Dahlias can never recover from spotted wilt and, as all the progeny from infected plants will in turn be affected, to propagate new plants next season from infected stock is folly.

Gladioli which finished flowering soon after Christmas in mild northern districts should now be lifted as soon as the leaves show any marked change in colour. If plants are left in the border until the leaves have died down completely, many of the cormlets will become detached from the main corms and be left behind in the soil. After being lifted the plants should be dried thoroughly before the leaves are cut off. In later districts gladioli are now at their best, and it is doubtful if any country in the world can produce better gladioli than New Zealand. Gardeners who wish to try their hand at breeding new varieties of gladioli should refer to page 311 of the "Journal" for September, 1947, where breeding methods were described in detail.

Hoeing is still necessary, even though the garden looks weed-free at this time of year. Regular hoeing between plants in the border with some suitable tool prevents weed seedlings from becoming established. Killing young weeds in the hot, dry, summer



If sweet pea seeds are to be saved for next year, fading flowers should no longer be picked off, the seed pods being left to ripen. No special precautions are needed to prevent cross-pollination, as sweet peas are self-pollinated and usually come true from seed.



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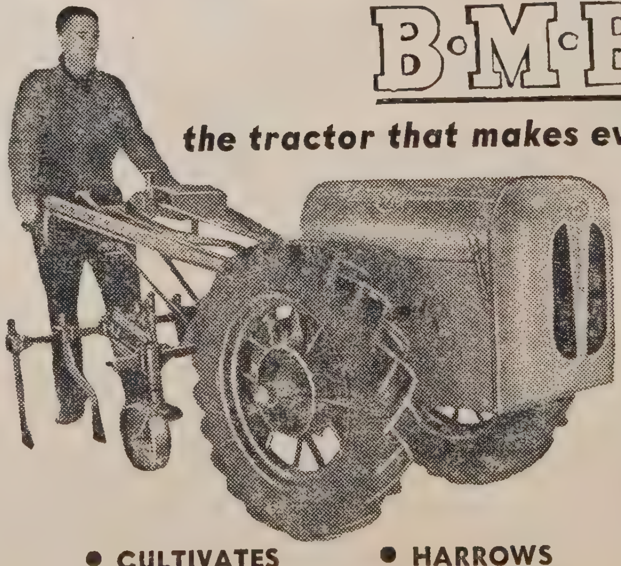

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weather is so easy that all the borders should now be weed-free in a well-cared-for garden.

Hydrangeas of some varieties fade badly toward the end of hot, sunny summers if they are growing fully exposed to the sun. Faded blooms should be cut off to tidy up the bushes. Hydrangeas are best planted in partly-shaded positions, as their flowers grow and colour to perfection where they have some relief from direct midday sunshine.

Lawns should be re-dressed with paris green (poisonous) bait, as described last month, in districts where subterranean grass caterpillars (porina moth caterpillars) are usually troublesome. The grass should not be cut too short or too often in dry weather, during which the blades of the machine should be set higher than usual. The flat weeds that make a lawn look unsightly can be killed most easily by using a hormone weedkiller, applied according to the maker's directions on a still, warm day. Great care must be taken not to allow spray or drift to come in contact with garden flowers or vegetables (especially tomatoes) and to wash out the syringe or sprayer very thoroughly after use, again following the maker's directions precisely. Where a new lawn is to be sown next month, continue preparing the area, working up the surface by continual "heeling" and raking. The aim is an evenly-consolidated bed covered by a very shallow layer of loose soil in which the seed will be sown. As the surface is worked, move soil into the hollow places, using a straight-sided plank to show where the high and low places are. Achieving a truly-level surface is much easier before sowing than after the lawn has been established.

Lime can play an important part in the management of some garden soils, though many popular flowering plants neither appreciate nor require it. The question of liming the flower border was dealt with in detail in the May, 1948, issue. The wisest way to apply lime to the border is probably through the compost heap, scattering lime on the layers of material as the heap is made up. Composting should not be neglected in summer when dead flower heads, waste from the vegetable garden, lawn mowings, hedge clippings, and other forms of vegetable material accumulate quickly.

The perennial sunflowers are free-flowering, showy plants well worthy of a place in the mixed border and useful for cutting.

Pot marigolds (calendulas) are outstanding for autumn, winter, and spring displays of colour in mixed flower borders in all but the coldest districts of New Zealand. Plants raised in boxes by a succession of sowings from now on, or sown directly into borders, will make superb winter displays of flowers, with deeper, richer colours than pot marigolds often develop in summer. They make ideal foils for narcissi and daffodils in mixed borders, and hybrid wallflowers enhance the display. It is essential to give each plant at least 9 or 10in. of space each way and to remove fading flower heads once a week. Failure to remove dead flower heads regularly is probably the cause of many home gardeners failing to appreciate the true worth of pot marigolds.

Pot plants watered daily in hot weather often suffer from lack of proper aeration. The daily watering, representing a rainfall many times greater and more fierce than soil would ever receive naturally, results in the soil particles in the surface layer "running together" into a solid mass through which air does not pass readily. The "running together" becomes progressively worse at each watering until finally the surface soil loses all its porous character. The use of correct ingredients in the potting compost, especially the proper grades of peat and sand, helps soil to keep its crumb structure and delays the "running together" process, but even the best composts tend to lose their structure under constant watering. To keep the soil in good condition the surface of each pot should be stirred with a nail as soon as it is seen to be getting hard, preferably an hour or

Packing of Specimens for Identification or Diagnosis

SOMETIMES it is necessary for specimens of plants to be sent to the Horticulture Division for identification or the diagnosis of diseases, but all too often specimens are so small or incorrectly packed that little can be learned from their examination when the parcel is opened. Moreover, wilting leaves are often a symptom of disease in the stem or roots, and an examination of the leaves alone will reveal nothing of the cause of the trouble. Wherever possible, whole plants or complete shoots should be sent for diagnosis of diseases, and as large a piece of the plant as possible, including flowers or fruits, should be sent where identification of the plant is required.

If whole plants are sent, wrap the roots of each, with a little soil, in a ball surrounded by greaseproof paper to keep the soil off the rest of the plants, then damp the foliage slightly, wrap the whole in more greaseproof paper, surround it with several sheets of newspaper, and finally pack it into a stout cardboard box for posting. Plants packed in this way will travel well, even though they are several days in the post.

Live insects should be packed in a tin with enough leaves of the plant on which they were feeding to fill the tin and prevent the insects from rolling about in it. If rotting fruits, bulbs, or other dead material has to be sent, wrap each piece in greaseproof paper and pack them in a tin box, with balls of newspaper to prevent the items being thrown about.

two after it has been watered. If the soil when stirred is seen to be very fine, with little sign of fibre, scrape loose and remove the top inch or so of soil from each pot, without interfering with the roots more than is necessary, and refill with new potting compost or well-rotted sievings from the compost heap. The more humus the surface soil contains, the longer will it stay in good physical condition under the frequent waterings needed by pot plants in summer.

Staking continues to be an important part of the management of flower borders. Late herbaceous plants such as perennial asters (michaelmas daisies) and chrysanthemums require strong stakes to support them against autumn gales. Stakes should be driven well into the ground, preferably so that their points enter the subsoil, as that provides firm anchorage. The stakes should be driven a few inches from the plants to reduce the risk of their damaging major roots as they pass through the ground.

Watering is an important task in late summer, but it must be done with discretion to make sure that the water is used to best advantage. The appearance of the surface gives little indication of whether a bed needs watering. The best guide is to dig a hole in the border with a trowel to a depth of 12 to 18in. and test the moisture content of the lower layers of soil by squeezing a handful and then opening the hand to leave the ball of soil on the palm. If the ball remains intact, there is probably sufficient moisture in the soil to maintain plant growth; if it breaks into one or two pieces, it has reached the critical point at which a further supply of water will be needed shortly; if the soil crumbles down when the hand is opened, there is not enough moisture in the soil to keep plants growing well and it should be watered thoroughly. A few hours after being watered soil at different levels should be tested again for moisture content to see whether the water has penetrated to and wet the dry layers.

Plants to Propagate this Month to Ensure a Garden Full of Flowers

Budding of roses and other plants should be in full swing and should continue for as long as the bark lifts freely without tearing.

Cuttings of many plants root well in late summer, but gardeners should never take cuttings from any plants but the best. It is all too easy to fill a garden with mediocre plants instead of propagating only those that are really worth while. The ends off young shoots of violas, dianthus species, marguerites, geraniums, hydrangeas, and lavender root easily in a frame. Non-flowering side shoots of pentstemons, antirrhinums, rambler roses, and fuchsias also make easily-rooted cuttings. Short cuttings of ericas and heaths, taken from side shoots with a little heel of old wood trimmed level with a razor blade, can be rooted in a small frame, kept moist or covered with a large glass jar, inverted, to ensure that the atmosphere around them is moist enough to prevent the young shoots from flagging. Rooting hormones facilitate the rooting of many types of cuttings. They should always be used exactly according to the maker's directions for best results.

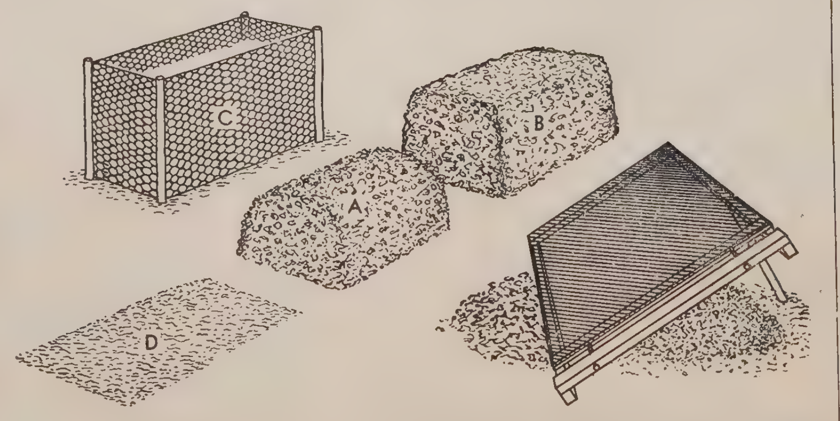
Lift, divide, and replant lilies and bearded irises soon after the flowers are over, as they are then more or less dormant and resent being moved less at that time of year than later in the winter, by which time each plant will have started to produce a new root system.

Plant out self-sown seedlings from the boxes pricked out last month and any cuttings or pipings taken earlier that are now starting to grow in the frame. When planting out during summer always water plants well an hour or two before lifting them and again after planting.

Pot up or prick out seedlings sown earlier as this becomes necessary. For best results plants should never have a check from their seedling stage to flowering time. The best way to avoid these checks is to prick out seedlings as early as possible—as soon as they can be handled—and pot on plants before they become "pot bound"—before the roots have exhausted the soil in the pots and the plants begin to suffer from starvation. Cinerarias, cyclamen, and primulas will now be ready to pot on into the pots in which they will flower. Box up a few more self-sown seedlings, lifted from the borders after being watered.

Sow an early batch of sweet peas, both winter flowering and Spencer varieties in mild districts, either into the place where they are to grow, if this has been prepared, or in boxes. Sow Iceland poppies in boxes and keep them in a cool place until the seedlings are well up. In mild districts where there is room in the borders sow hardy annuals thinly for spring flowering. Seeds of biennials and herbaceous perennials can still be sown in mild northern districts.

Sow, Plant, or Propagate Something Every Month



A CONVENIENT layout for composting in a small home garden. Each heap is kept tidy while being made up by being surrounded with wire netting on 4 stakes (C). Heaps A and B are in process of rotting down. A heap has just been cleared from D and the compost screened, the material that went through the screen now being ready to be put on the garden. Rough, unrotted material which will not go through is put on the current heap (A) to rot further. When this heap is about 4ft. high the stakes and netting will be transferred to D and the process continued.

Growth of a plant is checked by lack of water long before signs of wilting are visible, and waiting until plants flag before watering them is bad gardening.

Other Tasks for the Month

Spray ornamental plants with lead arsenate (poisonous) for **caterpillars** as soon as the first signs of damage are noticed. The aim should always be to kill caterpillars while they are still very young and before they have time to disfigure leaves.

Regular removal of **dead flower heads** becomes more and more necessary as hot dry weather slows up the growth of plants.

Continue spraying **geraniums** to prevent trouble from rust, as recommended in last month's notes.

Stack turfy **loam** for use in mixing seed-sowing and potting compost in spring.

Pot on any plants that need larger pots.

Factors Affecting Success in Preserving

NOW that 6 years of sugar rationing are over, and tinned fruits are much more expensive than formerly, many housewives may be considering for the first time the possibility of preserving their own fruit, and others may wish to begin again after several years of going without home-preserved fruit. Though efficient equipment, absolute cleanliness, the use of only sound fruit, and careful checking to ensure that the seal is perfect are important factors in the production of attractively-preserved fruit to entice the family's appetites during winter, a knowledge of the reasons for the operations recommended may be interesting. Why, for example, in bottling is it necessary to use only first-quality fruit, or to cook for certain times? These and other factors are discussed in this article by Evelyn E. Moore, Rural Sociologist, Department of Agriculture, Auckland.

[Sparrow Industrial Pictures Ltd. photo.

TO be successful, preserving must accomplish two things: The enzymes must be destroyed or prevented from acting, and yeasts, moulds, and bacteria must be destroyed.

Action of Enzymes

Enzymes, which are chemical substances present in all fresh foods, are responsible for the normal ripening of fruits and vegetables and for the tendering of meat when it is hung. They also cause browning in bruised apples and discoloration of fruits and vegetables which are cut and exposed to air. If they are allowed to act unchecked, the normal processes of decay will result, but fortunately the majority are easily destroyed by heating. Freezing also checks enzyme action.

The action of enzymes which have not been destroyed by heat is responsible for the brown colour which sometimes develops in preserved pears when the surface of the liquid is below the level of the fruit. Precooking the pears before bottling them, and then processing them, or ensuring that the liquid covers the fruit will often prevent this from happening, though such jars of fruit need not be discarded, for the brown fruit is quite wholesome.

Yeasts and Moulds

Yeasts and moulds are present at all times in the air, water, and soil. Yeasts can do much damage by causing fermentation in jams, jellies, and preserved fruits. Moulds, though less harmful, as they grow mainly on the surface of jams and foods, also cause wastage if their flavour penetrates the food. However, most of them are harmless—in fact, some moulds are used in the ripening of cheeses, and other common ones, including the green mould which frequently grows on the surface of jam, belong to the same family as the one from which penicillin is obtained.

Both moulds and yeasts are easily destroyed by heat, 10 minutes at a temperature of 165 degrees F. being sufficient to kill most of them. Consequently spoilage caused by these organisms is usually the result of inadequate precautions to seal the jam or fruit as soon as it is poured into the jars; the use of jars which have not been rewashed in hot water after storage, and which therefore are usually a little dusty and perhaps heavily contaminated with mould or yeast spores; or storing jams or preserves in a warm, damp place, where moulds and yeasts develop much more easily and rapidly.

Bacteria

Bacteria present by far the greatest problem in the preservation of fruits and vegetables, for they form heat-resistant spores which in a non-acid solution—which is present when vegetables or meat are boiled in water—may withstand 4 or 5 hours of continuous boiling and then become active again if conditions in the preserved food are suitable. For example, preserved vegetables may remain in excellent condition when stored at a temperature of 50 degrees F., but quickly go bad if the temperature rises to 70 or 80 degrees F., at which the spores become active. These facts are taken advantage of in the use of yeast for bread baking, the manufacture of vinegar and wines, and in other processes.

However, the long cooking necessary to ensure that vegetables are safely preserved destroys the flavour, and much of the vitamins C and B_1 as well, so it is advisable to use a pressure cooker for preserving these foods, as the bacteria are destroyed quickly at the higher temperature in the cooker.

The acid in fruit destroys bacteria much more quickly, and acid (either lemon juice or vinegar) added to the water in which vegetables are preserved in the proportion of 1 pint of vinegar or ¾ pint of lemon juice to 2 quarts of water is stated by some authorities to have the same effect, though naturally the flavour is altered slightly. Lemon juice is usually regarded as more palatable than vinegar for this purpose.

Causes of Spoilage

Therefore, in preservation the aim is to produce conditions under which organisms and enzymes cannot cause decay. Jams, pickles, and dried, salted, and preservatised foods rarely are sterile, and they are preserved by lack of moisture or the presence of a substance which prevents the organisms which cause spoilage from growing and multiplying. In bottled and tinned fruits and vegetables, which are preserved as nearly as possible in their natural state, preservation is effected by killing all the yeasts, moulds, and bacteria, which will grow under normal storage conditions, and then sealing the foods in an airtight jar or can so that no spoilage organisms can enter.

That is why there is always an element of risk in preserving such foods as plums, black currants, and passion fruit in jars without sterilising them adequately, even though these fruits are acid and therefore easier to preserve. They have often been preserved satisfactorily by simply packing them in clean, sterilised jars and pouring on boiling or even cold water (or in the case of passion fruit by filling the jar with pulp and sugar), and then sealing them down tightly at once. Especially with firm, clean, home-grown fruit picked and packed immediately, this method may be successful, but bruised or dusty fruit and fruit which has been packed and marketed is likely to be well contaminated with spoilage organisms, so that the likelihood of its keeping unless properly sterilised is small.

In addition, bacteria types vary with the year, locality, and climate, some being more heat resistant than others, so that while one lot of fruit may keep well when preserved under certain conditions, a lot preserved under similar conditions the following year may fail to keep. However, it is only when foods are not cooked for the recommended times, or when fruit is dusty or overripe, that spoilage may occur, though when self-sealing lids are used it is imperative that the fruit be properly sterilised and boiling hot or a vacuum will not form and the jar will not be properly sealed.

Equipment for Preserving

Though expensive equipment is not necessary for successful preserving, there are some points which, if carefully checked, will prevent failures and spoilage caused by seals which are not airtight.

Jars should all be inspected carefully and those with slight cracks, chips, or a very rough finish around the rim discarded, for these may prevent a perfect seal forming with self-sealing lids. Even though bottles have been washed thoroughly before storage, they should be washed again before being used to remove any dust containing mould, yeast, and bacteria spores, which may cause the food to ferment or become mouldy later. New rubber rings or inner caps should be used; it is often false economy to use old ones, which, though they appear sound, may perish during the sterilisation of the fruit.

Preserving can be carried out by several methods, each requiring slightly-different equipment. Perhaps the most common is the water-bath method. If it is used, the size or shape of the container is unimportant and depends usually on the amount of fruit to be preserved, but it should always be deep enough to allow the water to cover the tops of the jars if self-sealing lids or skin seals are used. A large billy, a kerosene tin with one side cut out, or the copper will serve, thus involving little extra expenditure. Something on which to stand the bottles in the container is essential to prevent them from bumping together when the water boils. Straw, an old cloth, or newspaper may be used, but a rack which fits the bottom of the container neatly is more convenient. It can be made from thin slats of wood nailed together, with a wire handle attached at each end, so that the bottles may be easily lifted in and out of the boiling water.

A long-handled spoon for packing the fruit, a wire basket or piece of muslin for blanching tomatoes, tongs for lifting the jars, and plenty of clean towels or butter muslin and large, heavy pot holders are useful.

Two other methods of preserving fruit are common: The open-pan method, in which the boiling, cooked fruit is ladled straight into hot, sterilised bottles, which are sealed immediately; and packing the jars with fruit and syrup, placing them in a shallow baking tin of water, and processing them in the oven at 250 degrees F. for about an hour for most fruits and 1½ hours for tomatoes.

For the open-pan method the fruit may be cooked in an ordinary saucepan, so special equipment is not needed, but handling is more difficult, as jars and lids have to be sterilised in boiling water, removed and filled with boiling fruit and syrup, and sealed immediately. The jars must be sterilised for this method or some yeasts or bacteria may survive contact with the boiling fruit, which cools rapidly when it is poured into the jars.

For the other method a much longer time is required to cook the fruit, which often is not cooked evenly throughout the jar, and unless the oven heats very evenly some jars of fruit may be cooked more quickly than others, involving rearrangement of the jars—a difficult process when the jars are hot.

A fourth and perhaps ideal method is to use a pressure cooker specially adapted for the preservation of fruits and vegetables.

[*Sparrow Industrial Pictures Ltd. photo.*

The preparing and packing of gooseberries. After the syrup has been added a knife may be inserted down the side of the jar to remove air bubbles.

Bottling Fruit and Tomatoes

For results which would be suitable for show purposes it is necessary to treat almost every individual fruit differently, but a few simple rules are applicable when bottling all fruits.

Selection of Fruits

The selection of only sound, firm, ripe, clean fruit is perhaps the most important factor for success in bottling fruit. Failure can often be traced to the use of overripe fruit or windfalls which are bruised and dusty, for even when washed these fruits may still harbour many of the bacteria present in soil and responsible for spoilage in bottled foods. If these fruits are to be used, all traces of bruised parts should be removed, for they are more difficult to sterilise and may be responsible for the fruit going brown during storage. There is also a danger that overripe fruit may be cooked before it is sterilised properly, adequate sterilisation resulting in a mushy, unattractive product.

Preparation of Syrup

Fruits can be bottled successfully without sugar, for a sugar syrup does not prevent fruit from spoiling, but the use of a syrup is an advantage, as it improves the flavour greatly. The syrup in which the fruit is preserved may be of any desired strength and may be varied according to taste and convenience.

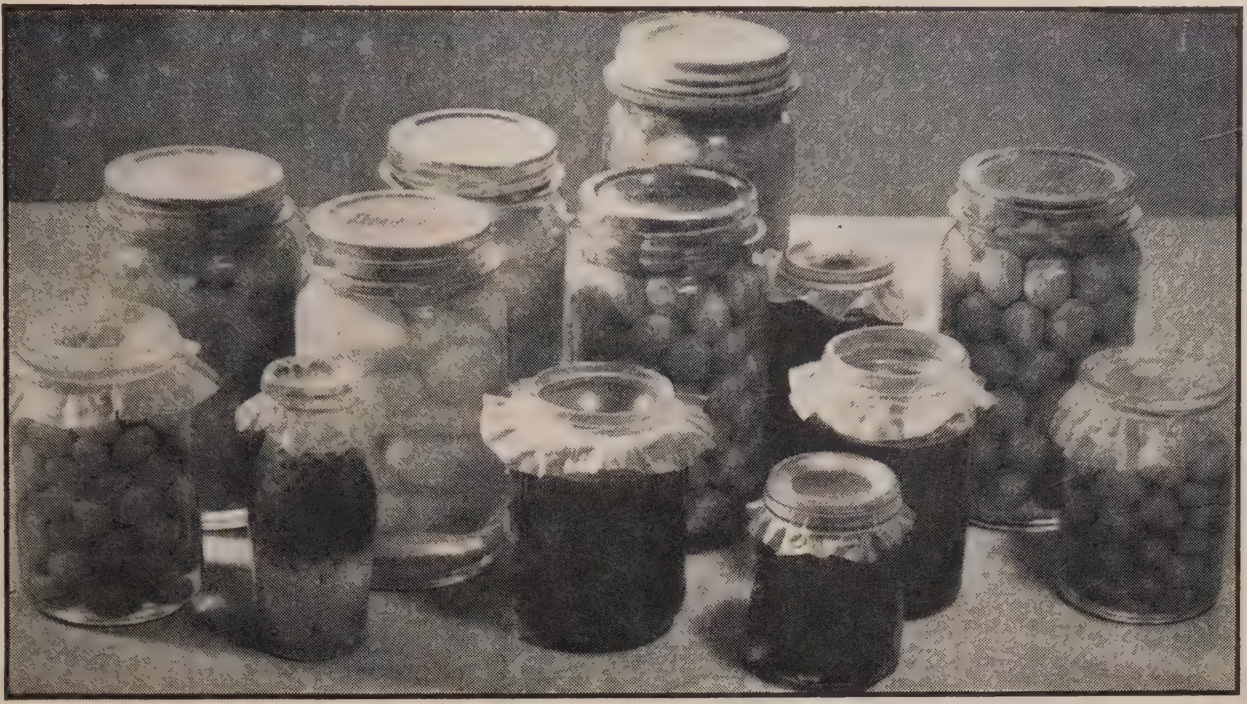
When the proportion of sugar to water is high (1 part of sugar to 1 part of water) the fruit may rise to the top of the jar. That does not matter for household use, but it is a disadvantage if fruit is bottled for exhibition. Usually such a syrup is used only for sour stone fruits.

A medium syrup contains 1 part of sugar and 2 parts of water and is suitable for preserving all varieties of fruit.

A light syrup, containing 1 part of sugar to 3 parts of water, is used chiefly for berries and sweeter fruits, for berry skins are likely to become shrivelled and tough in a heavier syrup.

The syrup is made by dissolving the sugar in the water and bringing it to the boil; it may be boiled for 5 minutes if desired, thickening it slightly. Honey may be used instead of sugar, giving the fruit a slightly-different flavour.

FACTORS AFFECTING SUCCESS IN PRESERVING



[*Sparrow Industrial Pictures Ltd. photo.*

Jars of fruit preserved with three different types of seal.

Preparing and Packing

In general, fruit is prepared for bottling just as it would be for stewing, though peaches, tomatoes, and tree tomatoes may be dipped in boiling water for a moment to facilitate peeling.

It may be packed in any attractive way—whole, halved, or sliced, according to the variety, though more fruit will go into a jar if it is sliced, halved, or precooked than if it is left whole. After being packed and filled with syrup jars should be shaken gently, or a knife or spatula slid down the side of the jar, to remove air bubbles. Whether they are filled to overflowing or not depends on the special directions for the type of covering and the method being used.

Sterilising and Cooking

Except when the open-pan method is used—in which case the fruit is cooked as it would be for stewing, poured boiling hot into hot, sterilised jars, and sealed down immediately with lids which have also been sterilised—the tops are adjusted according to the directions which are usually given on the packet and the fruit processed or cooked for the requisite time. Greasing the thread on the inside of a self-sealing lid facilitates its removal after processing.

Usually it is sufficient to process fruits until they appear to be cooked. With most fruits packed raw this takes from 20 to 30 minutes by the boiling water-bath method. Tomatoes, because they are less acid, require longer processing to ensure that they will keep and, though they may cook in a much shorter time, it is desirable that they be processed for 45 minutes. Fruits packed partially cooked require from 5 to 15 minutes' sterilising.

The jars should be removed from the processor as soon as the fruit is cooked. Jars with self-sealing lids or skin seals should be handled carefully in an upright position to avoid breaking the seal, and stood overnight to cool. When they are being removed from the oven or boiling water bath, care should be taken to stand them on a cloth or wooden bench away from draughts to preclude the possibility of the jars cracking.

On the following day the seals should be tested. Jars with rubber rings and zinc screw tops or glass caps which have been inverted to cool should be examined for signs of leakage. The outer screw tops should be removed from self-sealing jars and the seals tested either by lifting each jar gently by the cap or by tapping the inner cap gently with a spoon; a clear, ringing sound denotes a good vacuum and tight seal, but the sound will be dull if any fruit is touching the lid. Good skin seals should be taut and concave.

The jars of fruit may be labelled with the date if desired and stored in a cool, dry place protected from strong light, which may cause the fruit to fade and lose its attractive appearance.

Precaution with Vegetables

Neither Australian nor English authorities recommend preserving vegetables without acid by these methods because of the danger of botulism, a fatal type of food poisoning. It is caused by heat-resistant bacteria, which can multiply and release the toxin only in non-acid solutions, so that fruits and vegetables preserved in acid never contain the botulism-producing toxin. So far as is known botulism does not occur in New Zealand, but if vegetables and meat are preserved without acid, or without the use of a pressure cooker (the spores of all bacteria are killed by the high temperatures in a pressure cooker), it is a wise precaution to boil them for 15 minutes before serving them, as that destroys the toxin.

Reference Books

For women who are interested in more detailed information about food preservation some reliable books are procurable, to some of which the author is indebted for information. They include "The Complete Book of Home Food Preservation," by Cyril Grange, F.R.H.S. (published by Cassell and Company Ltd., London); "Canned Foods," by J. G. Baumgartner (J. and A. Churchill Ltd., London); "Domestic Preservation of Fruit and Vegetables," Bulletin Number 21, Ministry of Agriculture and Fisheries, London; "Fruit and Vegetable Preserving" and "Present Time Gardening," by J. Story (Dent and Sons, London).

DIAGRAMS for QUILTED SEWING BAG

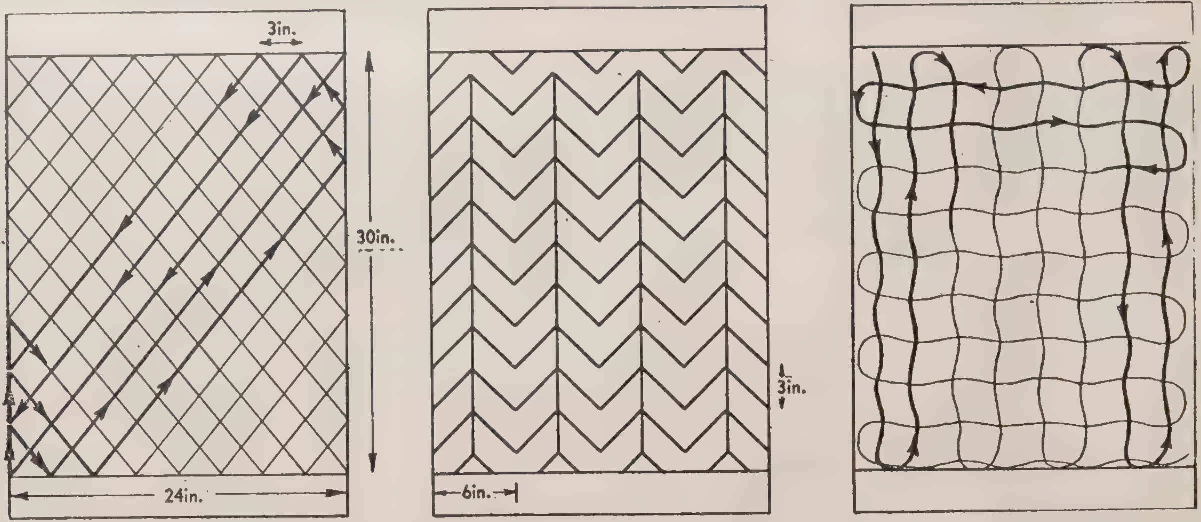


Fig. 1—Suggestions for quilting patterns.

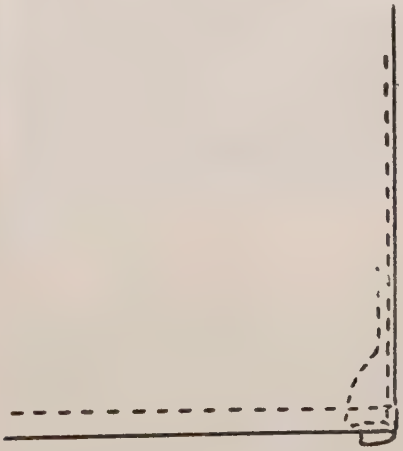


Fig. 2—Stitching at corners of the pockets.

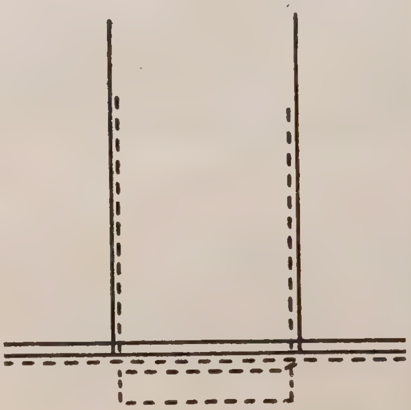


Fig. 3—Stitching at bases of handles.

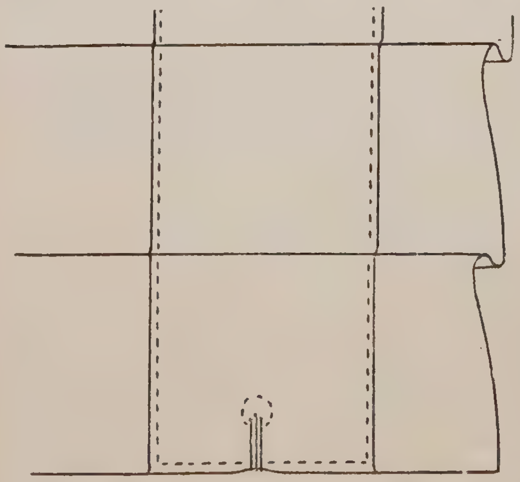


Fig. 4—Securing gathers at ends of ruler.

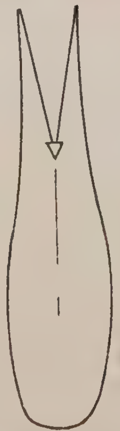


Fig. 5 — Location of an arrowhead at the side of the bag.

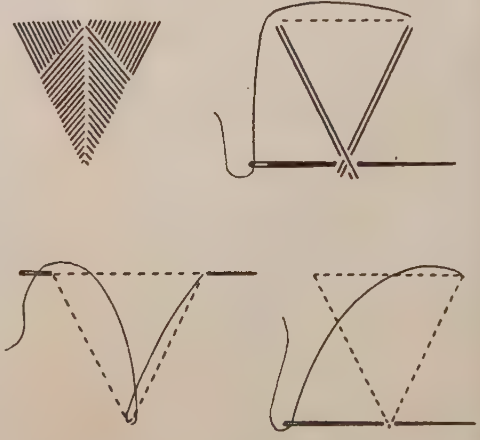


Fig. 6—The making of an arrowhead.

Quilting is Fashionable Again

QUILTING, one of the older domestic crafts, has become fashionable again recently. The modern version is much simplified, stitching is done by machine rather than by hand, and the quilting is used for a decorative effect for smaller articles such as bedjackets, nightdress and handkerchief cases, and table mats rather than as an essential part in the construction of a warm bed covering. The sewing bag described in this article by Norma K. Metson, Rural Sociologist, Department of Agriculture, Wellington, is large enough to be useful for dressmaking or family mending. A smaller one of the same type could be made to hold embroidery or knitting.

SUITABLE fabrics for the outer cover of the bag are down-proof sateen, plastic-coated cotton, or glazed chintz, and for the lining sateen, poplin, or rayon taffeta. The quantities required are:—

Outer covering: 1yd. of 27in. or 30in. material, ¾yd. of 36in. material.

Lining: 1¼yds. of 27in. or 30in. material, 1yd. of 36in. material.

Interlining: Muslin or old sheeting 24in. x 30in.

Dressmaker's cotton padding: 24in. of padding 18in. wide.

Two rulers or pieces of light wooden beading 12in. long.

Stitching silk in toning or contrasting colour, pins, tacking thread, tailor's chalk.

If a straight-line quilting pattern is being used, a 3ft. ruler or straight edge is useful, and some sewing machines have a quilting attachment which can be used for the sewing.

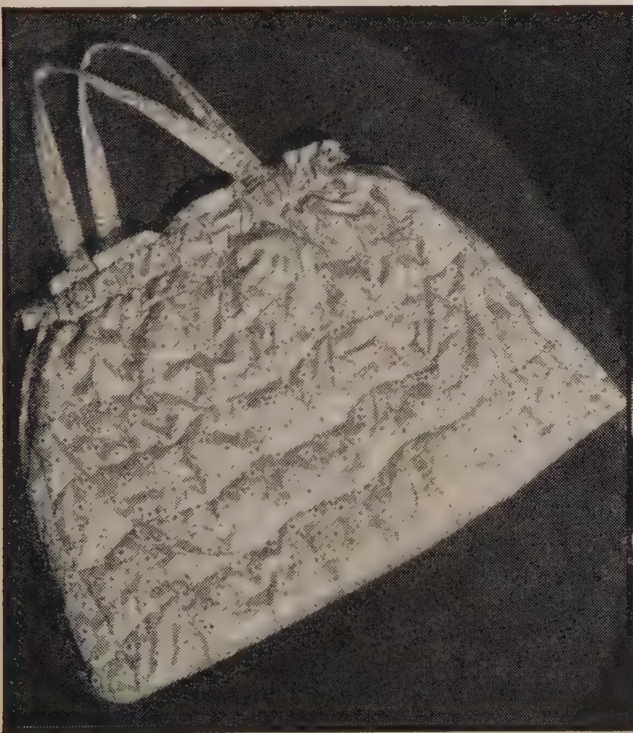
Straighten the ends of the material if necessary by tearing across it. From one side of the covering material take a strip 2½in. wide and 36in. long, and cut this in halves for the handles. Tear a piece 9in. wide from across one end of the lining to be used for pockets in the bag. Cut or tear a strip off one side of the lining material so that it corresponds exactly with the outer piece. Cut the muslin and the cotton padding 6in. shorter and 1in. narrower than the cover and lining.

Marking, Tacking, and Quilting

Lay the cover material flat, right side up, and mark four lines for stitching, one 1in. and one 2½in. from each end. The stitching along these lines will join lining and outer covering, making the heading frill and a slot for the insertion of the rulers. The bag will still look effective if the quilting stitching is haphazard and irregular, but the result is better if a pattern is measured and marked on the cover material at this stage. Suggestions based on curves and straight lines are given in Fig. 1. If a simple pattern is used and the work is done by machine, it will be completed rapidly, but the quilting can also be done by hand, following one of the many beautiful traditional patterns.

To prepare the material for quilting place the dressmaker's wadding on the wrong side of the cover material and adjust it so that 3in. at each end and ½in. at each side are left without padding. Cover the wadding with the butter muslin interlining, pin it in position carefully, and then tack together the 3 layers—cover, wadding, and muslin. This work is best done with the bag lying flat on the table, lifting only a small section at a time to make the stitches. Tack with long stitches, but firmly and smoothly, making sure that the material is not dragged or caught up anywhere. Care at this stage will make the machine stitching much easier and will prevent folding or pulling, which would spoil the appearance of the quilting.

When the tacking has been completed the material is ready to be quilted. Adjust the sewing machine by lengthening the stitch and loosening the tension a little.



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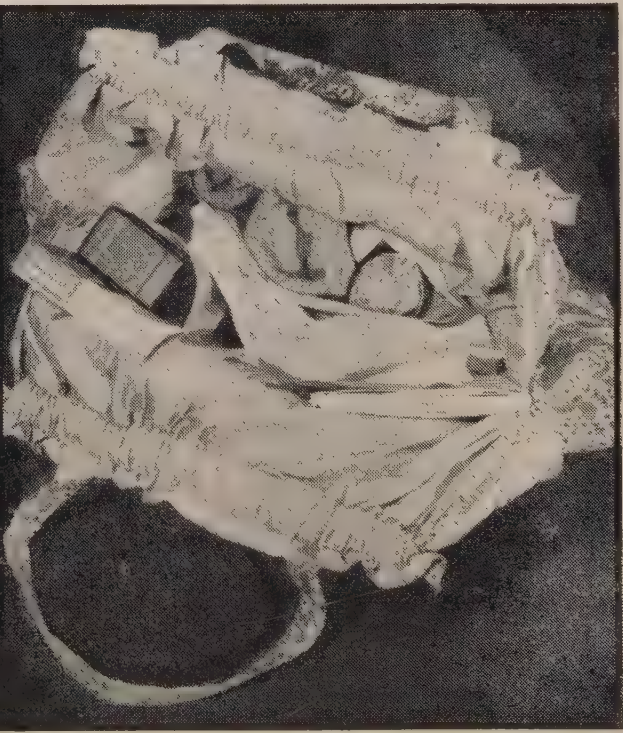

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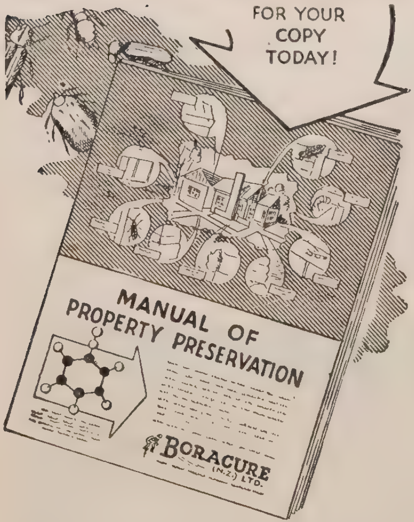
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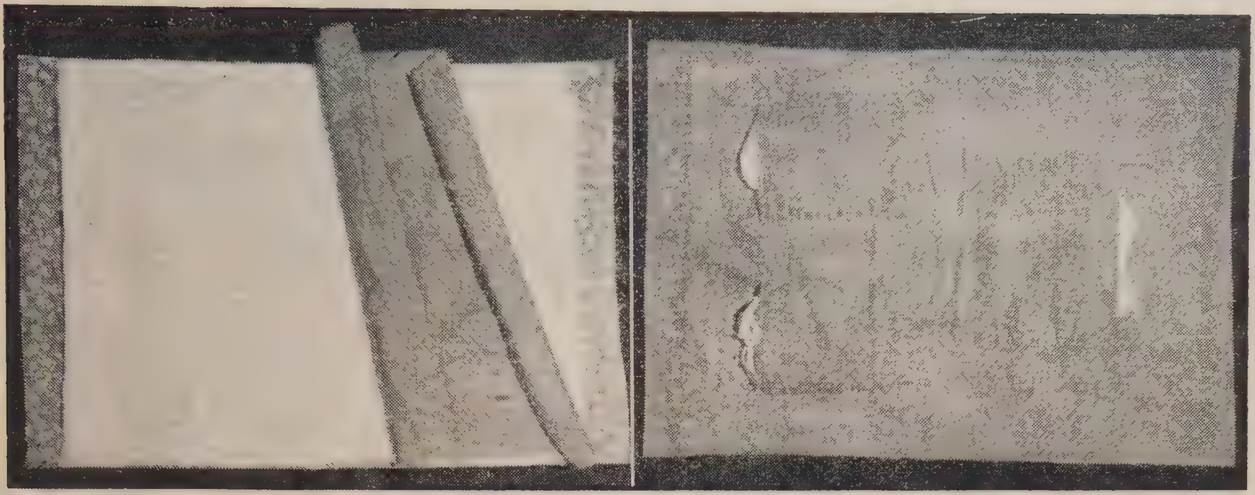
A QUILTED SEWING BAG



Left—Cover material, padding, and interlining tacked in position ready for quilting. Right—The lining with the pockets stitched in place.

Stitch in the directions indicated by the arrows, and do not try to work too quickly, especially in the parts where lines of stitching cross or come to a point, or folding will occur. Sometimes it may be necessary to clip a tacking thread and readjust the material slightly to prevent pulling. When the quilting is completed remove the tacking threads, trim the edges of the wadding, double the cover right sides together, stitch up the sides for about 11in., and turn the cover right side out.

Lining

From the 9in. strip which has been torn from the main piece of material cut pockets to sew on the lining. Large ones can be made to hold patterns, darning requirements, tape, elastic and bindings, ribbons and laces, and similar sewing supplies. If desired, smaller pockets can be tailored to fit scissors, tape measure, tailor's chalk, and other small items which otherwise would lose themselves in the depths of the bag, and a pin cushion and needle book can also be attached.

Hem across the tops of the pocket pieces, press a turn-in on the remaining 3 sides, and tack or pin them in position on the lining. Keep the pockets fairly low on the bag or their usefulness will be limited by the gathering folds when the material is drawn up along the rulers. Stitch the pockets in place, finishing the upper corners with a small triangle of stitching (Fig. 2) to give additional strength. With the pocket sides facing, double the lining and join the sides for 11in. as for the outer piece.

Handles

Make the handles for the bag from the two 18in. x 2½in. strips of outer material. Turn in the raw edges, fold each strip down the centre, and place a little padding in the fold. Stitch the open edges together and stitch the other side flat close to the fold. A criss-cross, straight, or curved quilting row may be added down the centre of the handle, and instead of the padding, buckram, canvas, or pieces from an old suede belt can be used for stiffening the handle.

With a gimlet, brace and bit, or a small nail make a hole about ¼in. from each end of the rulers.

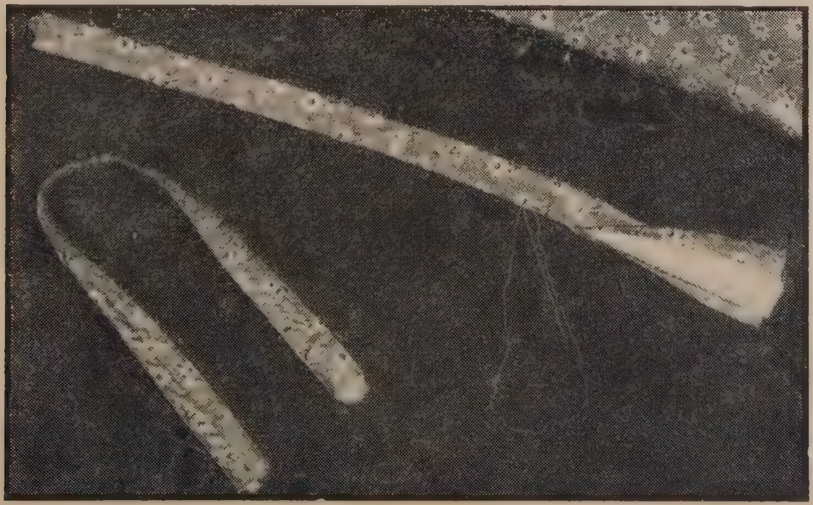
Making up the Bag

The next step is to join the lining and the quilted outer section of the bag. Press down a ¼ to ½in. turning at the top and sides of each piece. Mark the centre of the top edges by measuring or folding, and mark points 5in. on each side of the centres for the attachment of the handles. Tack lining and cover together along the top edges, inserting the ends of the handles about ½in. at the marked points so that they will be secured by the machine stitching. Stitch along close to the edge, doubling back at the bases of the handles (Fig. 3).

Stitch lining and cover together along the 2 lower lines to form the slots for the insertion of the rulers. Slip the rulers into position. Then complete the joining process by stitching the sides together by machine or hand sewing. Gather up the material along the rulers and fix it in place by taking 3 or 4 stitches through the material and the holes which were bored in the wood, and over the ends of the rulers (Fig. 4).

The lining should also be secured at the bottom of the bag. Take 2 or 3 stitches through lining and outer cover in each corner and in the middle of the base.

Complete the finishing by making arrowheads or bars on the side seams at the bases of the openings to prevent the stitching from breaking away when the bag is used (Figs. 5 and 6).



Upper—The making of a handle. Lower—The handle stitched and ready for insertion.

EMERGENCY MEALS FROM TINS

A WELL-STOCKED shelf of tinned and preserved foods which will provide an emergency meal is a boon to any country housewife. Shops are often some distance away, and there is no chance of obtaining supplies hurriedly if carloads of visitors on the way to their holiday destination call in as they are passing. Then there are the dreadful occasions when the weather turns hot and humid and the meat becomes tainted. The sudden opportunity for a day's outing can also upset prearranged plans for dinner. Even in the most carefully-run household such emergencies are certain to occur, and a reserve stock of foods is useful either to provide the entire meal or to supplement the menu. In this article Eva Topping, Rural Sociologist, Department of Agriculture, Auckland, suggests a variety of methods of serving tinned foods.

FOR a long while tinned foods have been hard to obtain, but of late many familiar ones have reappeared on grocers' shelves, and there are also several new lines. One corner of a cupboard or one shelf can be kept for these goods. If replacements are ordered at the first opportunity after any have been used, a choice of food for an emergency meal will always be offering.

Contents of Emergency Shelf

What is kept on such a shelf depends on the family's tastes and on the availability of supplies in the local store. Salmon, sardines, and herrings are the more scarce varieties of tinned fish, as they are imported lines; pilchards, yellowtail, whitebait, mussels, oysters, mullet, kahawai, trevalli, and snapper, all of which are canned in New Zealand, are more readily obtainable. Appetising extra dishes with which to expand the meal or for the main course can be made from any of these products.

Tinned meat at present is mixed with vegetables or cereal, this measure having been adopted during meat rationing. Now that this restriction has been removed, no doubt the canning firms will soon be supplying tins containing meat alone and the choice will be much wider. Tongues, beef, mutton, sausages, and sausage-type mixtures are the tinned meats to keep in reserve.

Additional vegetables are usually on hand; potatoes and onions, for instance, are rarely difficult to find in a farm home, and greenstuffs and root vegetables can quickly be brought in from the garden. However, a stock of tinned peas, green beans, mixed vegetables, carrots, and mushrooms is good as a standby during the off season and can be used to add variety and bulk to salads if not required for a hot vegetable.

A splendid way of expanding a dinner is to serve soup, so tins of celery, oyster, tomato, asparagus, and vegetable soup should be included in the reserve stores.

BEEF HASH GARNISHED WITH FRIED ONION RINGS AND SURROUNDED BY TINNED PEAS AND CARROTS

A TIN OF SHEEP'S TONGUES AND VEAL BEING "DRESSED UP" APPETISINGLY FOR A COLD MEAL.

[Photographs on opposite page and above by Sparrow Industrial Pictures Ltd.

As well as tinned foods, other supplies normally kept in quantity in a country home will assist in producing an emergency meal. Bacon, cheese, sago, macaroni, tapioca, home-preserved fruits, pickles, and relishes are all helpful, and eggs and milk are, of course, much used for these occasions.

At first sight the keeping of tinned milk may appear superfluous, but sometimes it proves wise; for example, chance visitors in late evening may cause a shortage of fresh milk. Full-cream dried milk powder is quickly prepared for the supper cup of tea or coffee and has the advantage over tinned concentrated milk that only the amount required need be used once the tin is opened. If the lid is closed tightly after use, the remaining powder will keep quite well.

A good plan is to keep several easily- and quickly-prepared menus in mind; then, with all the necessary ingredients in the reserve cupboard, any unforeseen circumstances can be coped with. A menu for dinner or lunch using tinned meat, potatoes, tinned vegetables, and preserved fruit can be varied in several ways and made suitable for either warm or cold weather. Here are some recipes for main dishes which can be prepared from food stores kept in reserve; the quantities given will provide for about 4 people, and usually the preparation time is short:—

Hot Meals

Beef Hash

1 tin of corned beef
1 flat tablespoon of dripping
1 tablespoon of relish or chutney (Worcester, plum, or tomato sauce)
2 medium-sized onions
1 tablespoon of rolled oats or
1 dessertspoon of oatmeal
Water, stock, or left-over gravy

Peel the onions; slice one into rings and chop the other Melt the dripping in a saucepan and fry the onions until they are golden brown. Take out the rings, keep them hot, and use them to garnish the dish. Break up the contents of the tin of beef with a fork and mix it with the onion in the saucepan. Add the oatmeal, which is used to absorb the fat, so the quantity may vary a little with the amount of fat in the tin of beef. Stir in the chutney or sauce and sufficient liquid to make the mixture firm and slightly moist. Heat it thoroughly, but do not overcook it Pile it in the centre of a heated dish and arrange tinned peas and carrot mixture round the edges.

In the illustration the beef hash is accompanied by a dish of tinned peas and another of potatoes. Green beans or preserved tomatoes could replace the peas.

Corned Beef Rissoles

1 tin of corned beef
½ tablespoon of chopped chives
Thyme according to taste
Flour, salt, and pepper
Dripping for frying
½ tablespoon of chopped parsley
½ cup of soft breadcrumbs
Crisp breadcrumbs, oatmeal, or cornflakes
1 or 2 beaten eggs

Break up the beef in a basin, add the herbs, seasoning and soft breadcrumbs, and moisten the mixture with beaten egg. Form it into flat, round cakes, coat them with flour and dip them into beaten egg and milk mixture, then into crisp breadcrumbs, cornflakes, or oatmeal. Fry them on both sides until they are browned and heated through Drain them on soft paper and place them on a hot dish Garnish each rissole with a thin slice of raw tomato and a sprig of parsley. Preserved tomato quarters can be used if the pieces are well drained so that the liquid does not run on to the rissoles and make them cold.

Tinned mushrooms, thickened with a little cornflour, make an appetising sauce to serve with rissoles instead of the peas and carrot mixture used with the beef hash.

Curried Beef Casserole

2 onions
2 tablespoons of Worcester sauce
1 tin of corned beef
Dripping
2 tablespoons of chutney or thick sauce
1 teaspoon of curry powder

Chop and fry the onions, add the beef and other ingredients, mix them thoroughly, turn them into a casserole, and bake the mixture until it is well heated and browned on top.

Serve it with preserved or fresh stewed tomatoes, potatoes, and any other tinned or fresh vegetables available.

Cold Meals

For a cold meal tinned tongues, hard-boiled eggs, and salad are hard to better for ease and speed in preparation. The illustration on page 97 shows an appetising way of serving the tinned sheep's tongues and veal which is on the market at present. Boil eggs until they are hard and cut them in halves lengthwise, reserving one egg. Lay lettuce leaves on a dish and put the tinned meat in the centre. Chop the white of the spare egg and arrange it round the top edge of the meat and down the sides. Mash the yolk with a little melted butter, some cream or salad dressing, and salt and pepper, making it very smooth and fairly moist, then pipe a ring inside the chopped white of egg. Arrange any other salad ingredients—radishes, beetroot, spring onions, tomato, or grated carrot—on the dish around the meat and decorate it liberally with sprigs of parsley.

Sausage-type meats and a kind of brawn are also put up in tins, and they can be served similarly for cold meals.

Expanding a Meal

Perhaps the most usual emergency occurs when unexpected visitors arrive and, though the hostess wishes to give them a meal, the dinner or lunch in preparation is not sufficient for the increased number. Then the reserve foods shelf comes to the rescue by supplying another course or extras. Soups and fish dishes are good "extenders" for a meal, and vegetables, cheese, and fruits are useful for augmenting the meat course and desserts.

Most tinned soups are improved greatly by the addition of milk, seasonings, and flavourings. Bacon, or even just bacon rinds, and sprigs of thyme give a better flavour to tomato soup, for instance, and stock or left-over gravy is also helpful. Milk adds to the flavour, texture, quantity, and nutriment of tinned soup.

Crisp, fried sippets and a generous sprinkling of chopped parsley added to each plate when the soup is served will effectively banish the "out-of-a tin" taste.

Tinned Fish

Fish can be served as it comes from the tin, but for extending a meal by adding an extra course it is more useful if made up into a dish or fried. Herrings and pilchards are especially suited for frying. Drain the fish, dip it into oatmeal, then fry it until it is lightly browned and just hot. Serve it with lemon cut in slices, butterflies, or quarters. Thin slices of buttered brown bread should accompany the fish.

[*Sparrow Industrial Pictures Ltd. photo.*

Fried tinned herrings may be served as an extra course for dinner.

Fish Cakes

Salmon cakes were once a favourite way of serving this fish, but now that it is available only rarely, trevalli, kahawai, mullet, or snapper can be used instead. If there are some cooked mashed potatoes in the larder, these fish cakes provide a good addition to a meal.

1 tin of fish drained of juices
1 egg, slightly beaten
1 dessertspoon of chopped parsley
2 cups of mashed potatoes
Salt and pepper if required

Mix the ingredients and form them into flat, round cakes or balls. Roll them in flour or crisp breadcrumbs and fry them in deep, smoking-hot fat for 3 to 5 minutes. Drain them on soft paper and serve them at once with lemon slices and parsley garnishing.

Fish Envelope

A fish envelope takes a little longer to prepare, but is such a useful dish that the recipe is worth including.

1 tin of fish
3 tablespoons of soft breadcrumbs
Salt and pepper to taste
Tomatoes—3 fresh, skinned, and sliced, or 1 cup of preserved, drained quarters
2 teaspoons of lemon juice
Pastry

Flake the fish and mix it with the tomatoes, lemon juice, breadcrumbs, and seasonings. Roll the pastry into an oblong about 10in. by 12in. Put the fish filling in the centre, wet the edges of the pastry, and fold it into an envelope shape by taking the short sides to the middle first. Short pastry made with dripping or lard is the kind to use for a fish envelope.

Savoury Dishes

Lunch and breakfast dishes or savouries for supper are quickly prepared from tins of baked beans, spaghetti, macaroni cheese, sardines, and oysters, and they are also useful for snacks and sandwiches. Cheese is usually bought in sufficient quantity to last over the period between grocery orders, but one or two tins of cheese is a good addition to the reserve shelf.

Vegetable Cheese Casserole

2½ cups of tinned peas
8 very small onions
½ cup of preserved tomato pulp
Scone dough
1 cup of tinned carrots
¼lb. of cheese
Salt and pepper

Drain the liquid from the peas and carrots into a saucepan, heat it to boiling point, put in the peeled whole onions, and cook them for 10 minutes. Make the scone dough, using 1 cup of flour, and cut up the cheese. Strain the onions, add peas, carrots, tomato pulp, and cheese, mix them together, and pour them into a casserole. Cut the scone dough into rounds and set them on top of the vegetable mixture. Bake the casserole for 15 minutes in a moderately-hot oven—until the vegetables are hot and the scones cooked and lightly browned.

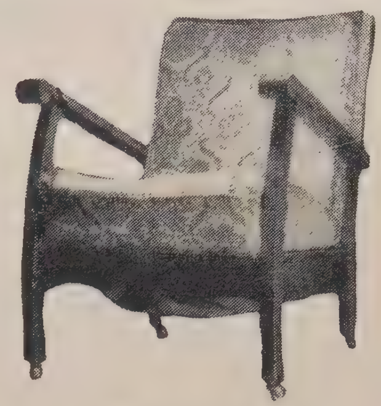
Tomatoes Stuffed with Baked Beans

Choose large, firm tomatoes, cut a slice from the top of each, and scoop out the pulp with a spoon. Mix the pulp with tinned baked beans and fill the tomato cases. Bake them until the tomatoes are cooked but still firm, and serve them on pieces of hot, buttered toast.

◆

A NEW COVER FOR A FIRESIDE CHAIR

WELL-SPRUNG fireside chairs like that illustrated are too valuable to discard when the cover is worn out, but putting a smart loose cover on them is not easy because of their plain wooden arms. However, making and attaching a complete new cover is comparatively easy, and if brass-headed tacks are available, the final result is very smart. The process is described in this article by Eirene Unwin, Rural Sociologist, Department of Agriculture, Dunedin.



The original—faded, patched, and worn.

THE chair illustrated was comfortable and quite well made, but the cover was shabby, patched, and faded. The springs were good and the wooden frame free from borer and well preserved. If there is not such a chair in the house, it would be worth while to buy one second hand and re-cover it at home. When buying such a chair good construction should be looked for, and points of good construction are mentioned later.

Repairing and Repadding

Patch the original cover wherever the stuffing or calico under-cover is showing. The patches need not match or be sewn on particularly neatly, but smooth edges are important so that ridges will not show through or wear the new cover.

The seat may have a hollow in it, as frequently occurs across the front; if it is not caused by broken springs or webbing, it may be padded up with several thicknesses of waste material or upholsterer's "layer wool." The layers of material or the wool should be arranged so that the pad thins out at the edges, and again it is important not to make a ridge with the stitching when sewing it to the chair.

Removing Outside Back Cover

Remove the cover from the outside back of the chair. If it is of material, it will be tacked on, and the tacks may be removed with a tack remover or, if one is not available, with a strong screwdriver. As the material is very likely to be rotted and faded, frequently it may be torn off and the tacks removed afterward or, if necessary, hammered in flat.

The re-covered chair, ready for more years of service.

If the cover is of 3-ply wood, the nails holding it in position must be removed, or it must be prised off carefully to avoid splitting it. That may be a task for a man.

When this cover is removed it will reveal the back springs. Points of good construction apparent in the illustration at the foot of page 105 are:—

The solid wooden battens to which the springs are fastened;

The little pieces of stuffing in each spring, so that they can never be compressed completely and rub metal on metal;

The hessian spring cover showing under the springs;

The piece of hessian machined to the back edge of the seat cover and pulled through and tacked down to the chair frame (Fig. 5M).

The sides and top edges of the back cover will not be visible, as they are held between the polished frame of the chair and the plain wooden inner frame to which the springs are fastened. If this inner frame is screwed to the outer, it may be taken right out and the new cover tacked to it as the original one was before it is put back again. However, if it is nailed, as was that illustrated, it cannot be removed and a method such as that described later must be used for fastening the new cover in position.

Removing the Bottom Cover

The hessian covering the bottom of the chair should be freed from either side. If it is in good condition, it need not be taken right off, but if it is at all worn, it should be removed completely and renewed. In the illustration of the under-side of the chair one side of the hessian has been loosened and rolled back, again revealing good points of the chair's construction:—

The strong copper springs placed close to each other;

The metal bands in place of webbing to which the base of each spring is bolted;

The hessian between the springs and these bands, and the pieces of stuffing, which prevent the metal springs from rubbing against the metal bands and squeaking;

At the extreme left the hessian continuation of the side of the seat cover, tacked to the framework of the chair (Fig. 1C).

Remove the tacks holding these side pieces of hessian so that the new cover may be pulled down and fastened between them and the sides of the chair.

All is now ready for measuring, cutting, and fitting the new cover.

Measuring the Material

Measure the original cover pieces and, allowing for seams, work out the sizes for each piece needed. At this stage all pieces should be considered as rectangles, except perhaps those for the sides of the seat. Allow plenty of length for both side back and side seat pieces, as in each case one end is drawn through to the back and tacked to the framework. Where a corner ultimately will be rounded it may be cut about ¼in. too small, as the curve will come on the bias of the material and so will stretch to fit tightly; if originally cut the full size, it will stretch and become loose.

The tuck-ins may be made of cheaper material, but it must be strong; hessian or calico does very well. The colour is not important, as the tuck-ins do not show. Allow sufficient of the cover material at O and P to go a good inch into the crack between the seat and back, plus seam allowance.

If the material is strong and does not fray easily, ½in. seams are sufficient if measuring is very careful; the amateur would be wiser to leave ¾ or 1in. seams. At least 1in. should be allowed on material that frays, so that all seam edges can be turned and machined to prevent ravelling. At G, D, E, and F ½ to ¾in. should also be left for turning under, as the material should never be tacked through a single edge.

Similarly at B and BB the lower part, hidden by the chair frame, may be of hessian or calico. The side pieces should be cut to reach about 1in. down inside the frame and the extensions to reach not quite to the bottom of it after a hem has been turned.

Cutting Out

Fig. 2 shows the cutting layout for the corduroy used for the chair illustrated. The material was 30in. wide

DIAGRAMS FOR RE-COVERING A FIRESIDE CHAIR

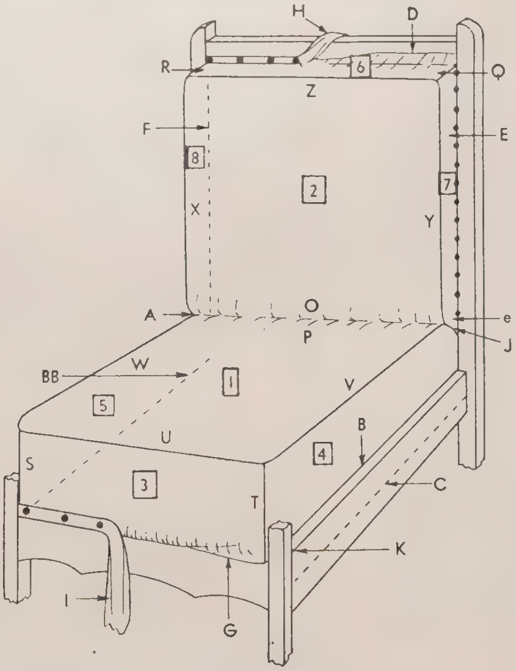

H
D
R
6
Q
Z
F
E
8
2
7
X
Y
A
O
e
P
J
BB
W
1
V
5
U
B
4
S
3
T
C
K
I
G

Fig. 1.

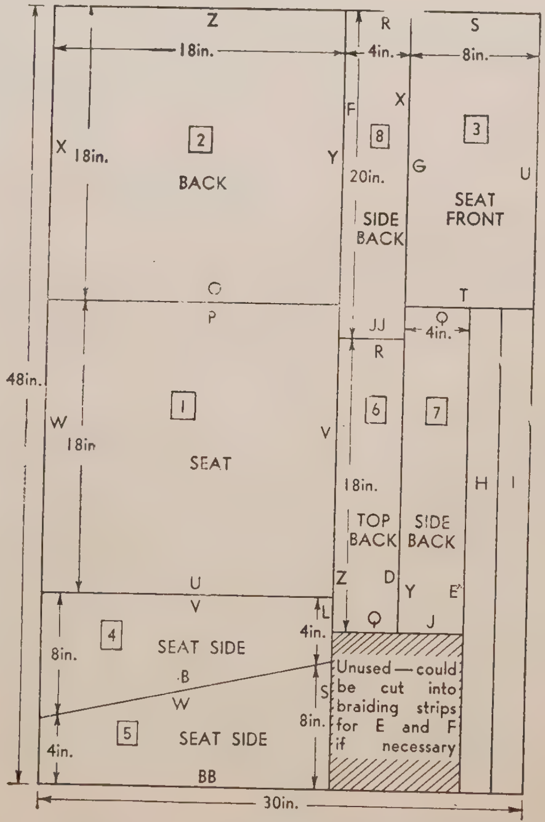

Z
R
S
18in.
4in.
8in.
X
F
8
3
X
18in.
2
BACK
Y
20in.
G
U
SIDE BACK
SEAT FRONT
O
P
T
JJ
Q
4in.
R
48in.
W
18in
1
SEAT
V
6
7
H
I
18in.
TOP BACK
SIDE BACK
Z
D
Y
E
U
V
L
4in.
Q
J
4
SEAT SIDE
8in.
B
W
S
Unused — could be cut into braiding strips for E and F if necessary
8in.
5
SEAT SIDE
4in.
BB
30in.

Fig. 2—Cutting layout on 30in. material. Extensions for tucking in are machined along the edges O, P, B, and BB, and ½in. turnings are allowed on all seams. The braiding strips H and I need be only 1 to 1½in. wide.

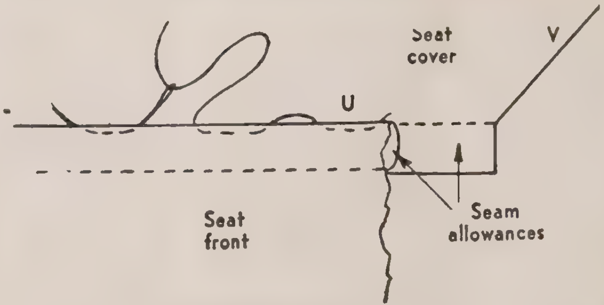

Seat cover
V
U
Seat front
Seam allowances

Fig. 3—Basting a lapped seam.

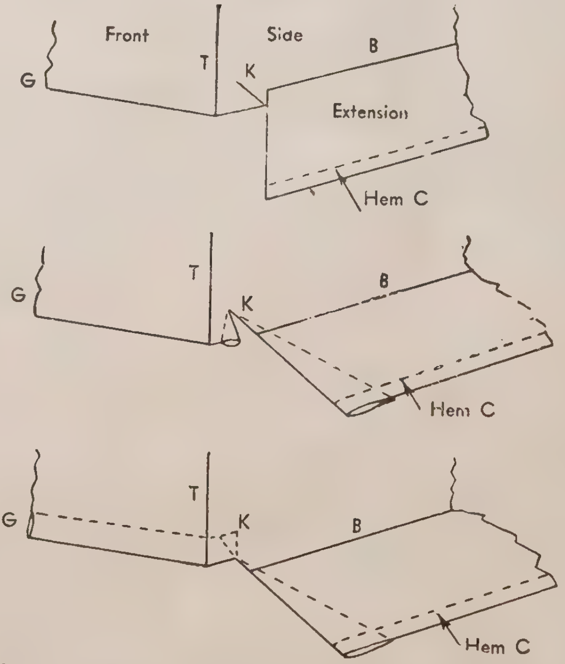

Front
Side
G
T
K
B
Extension
Hem C
G
T
K
B
Hem C
G
T
K
B
Hem C

Fig. 4—Fitting the front corners of the seat cover over the chair frame. Upper: Slash into the front corner at K. Middle: Turn the slashed edges under. Lower: Fold the bottom front under and tack it down with the braiding I.

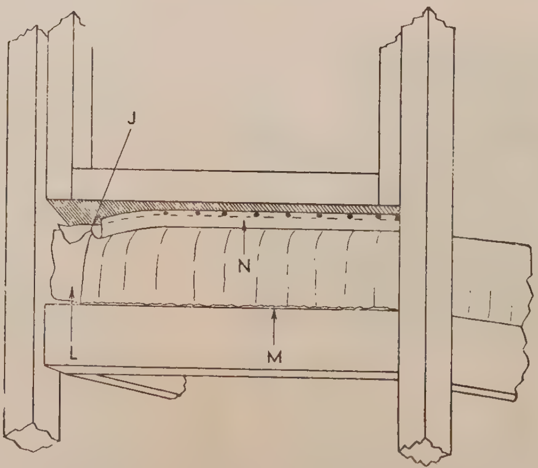
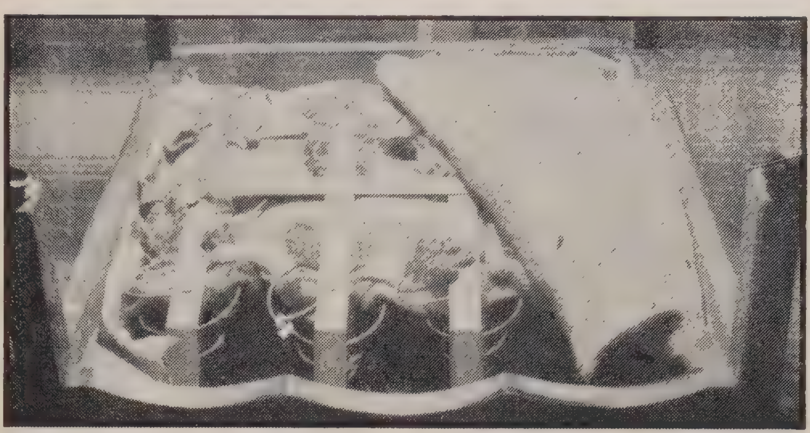


Fig. 5—The back of the chair, drawn slightly from below.

and 4t. was found to be sufficient; 2½ft. of 48in. material might do, but that would depend on the pattern. If the new cover material has a large pattern, obviously far more material will be needed, as it will be necessary to centre the design on the seat and back. Similarly, if the material is striped, the stripes must run the same way on the corresponding pieces on either side of the seat and back.



The under-side of the chair with the cover turned back, showing the springs, their metal supports, and the attachment of the sides of the seat cover.

Be sure to cut a right and left for the side seat pieces. The side pieces shown in Fig. 2 are identical, but by using them opposite ways they were made to fit. Such treatment means that one piece is slightly off the straight, and it should be done only if material is short.

Fitting and Machining

When the pieces are all cut out they should be fitted together on the chair. There are two ways of doing this: Fit them inside out and pin along all the seam lines, as in the illustration on this page, or fit them right side out, laying the main seat and back pieces on first and lapping the edge pieces over them, basting along the fold at the seam line with a semicircular needle (Fig. 3). If there is any likelihood that the two sides of the chair are not identical, as with a much-padded chair, the second method is the better.

In either case lay the middle line of the two main cover pieces to the middle line of the chair and back seat, anchor them in position, and work both ways from the middle while fitting the seams. This fitting both ways from the middle should again be done when finally attaching the cover to the chair. It is the only way of ensuring that the cover goes on straight.

If the top corners of the back are curved, the seams should be curved to fit closely and the extra cut away only after machining. Do not forget to fit curves extra tightly, so that as they stretch on the bias they will fit snugly.

After careful fitting, checking, and basting where necessary, the back cover and seat cover should be machined up, fitted on to the chair right side out, and measurements taken for the extensions. The tape measure can be slipped through the space between seat and back and bent up into the position that will be taken by the material when measuring the tuck-ins. If in doubt about how the pieces are to be arranged, examine how the original cover was fastened. Leave sufficient for a hem on all the extensions so that the tacks may be driven through double material. The extensions should then be cut out and machined to the cover, which is then ready to fasten to the chair.

Covering the Seat

The seat cover should be put on first. Lay it in position, smoothing it out from the middle as described, and anchor it in 4 places, about 1in. in from the middle of each edge (P, W, U, and V). Then turn back the sides and front and carefully sew the seam allowances down on to the original cover, again working from the centre out to either end of each seam. Be sure this stitching is smooth; a ridgy seam will wear the new cover when the chair is in use. This stitching of the seat piece separately to the chair ensures that the cover does not slip out of position, as might happen when the springs are compressed, and the shape of the seat consequently altered, whenever it is sat on; it is not necessary to do the same for the back, as it receives much less pressure.

To improve the appearance at G and D, the edge should be covered with a narrow strip of material or with braid. If the strip is of cover material, it should be a little longer than the width of the cover and about 1 to 1¼in. wide. Turn in the edges, folding it almost into 3, fold the ends under, and tack it on top of the edge of the cover. This edge should first be folded under and tacked near the centre and near either end. Do not fasten the braiding strip right to the ends yet. If brass-headed studs are used and care is taken that the studs are spaced evenly, the strips and studs improve the look of the chair considerably. If the cover material frays badly and such narrow strips are too awkward to handle, upholstery braid may be used instead.

The back of the chair with the cover removed, showing the springs, the wooden frame which supports them, and the back of the seat cover.

When the front of the seat cover is fastened to the outside of the frame, the sides (B and BB) must be drawn down inside the frame between it and the original cover. That will necessitate cutting the side cover diagonally to within about ½in. of each front corner so that the material may be folded back from the cut to fit over the chair frame (Fig. 4). Do not cut a piece right out.

The side pieces must be fastened from underneath, but fasten the front, tuck in the back edges, and be sure the cover is smooth and straight before turning the chair over. Then draw the side piece taut and tack it through the double hem to the inside of the frame (C). The original cover, and patches if it has any, are tacked down with the new cover, but (from this point of view) on top of it. Be sure the material does not come so close to the edge of the frame that it will show beneath it when the chair is in use. With the chair illustrated, as the springs were supported on metal bands instead of webbing, the ends being fastened also to the inside of the chair frame, the material of the side cover had to be cut up the middle for an inch or two to fit round the metal. If the chair has webbing, this will be fastened to the bottom of the frame, not inside it, so will not interfere with the cover material. Metal bands are much harder on the springs and therefore not really as good as webbing, which, though it wears out, is not difficult to replace.

The back corners need careful adjusting and perhaps snipping, as did the front corners, and part of the extreme back of the side piece should be pulled through to the back of the chair and tacked to the frame (Fig. 5L). It is these back ends of the sides of the original brocade seat cover which show in the illustration of the back of the chair with the cover removed—at either end of the hessian at the bottom. It is not necessary for them to be quite so long, and they are probably better tacked to the side of the frame than drawn across the back of the seat as shown. The seat cover is most easily fitted with the chair standing on a table, either right way up or over on its front.

Finally, tack the back tuck-in smoothly and tightly down to the top edge of the seat frame (Fig. 5M) on top of the original hessian cover extension. Again tack through the double hem.

Covering the Back

The back cover should be centred, smoothed into position, and anchored as was the seat cover, and the top edge (D) fastened with a braiding strip (H) as was done at G. Brass-headed studs should again be used here and down the sides. The edges E and F are turned under and the studs driven diagonally into the inner frame just inside the polished wood frame, as at e.

If this inner frame does not come sufficiently far forward, it may be better to tack the cover directly to the polished frame of the chair as at the top. Making this neat is not easy, and in some cases it may be necessary to use strips of material or braid instead of merely putting the studs through the turned-in edge of the material. While fastening the cover to the chair be careful to keep it smooth and taut all the time.

Between Back and Seat

When top and side edges are completed draw the tuck-in between the seat and back (A), pull it taut over the lowest bar of the frame supporting the springs (Fig. 5N), and tack it firmly in position through the double material of the hem, but leave about 3in. at each end free. Ordinary fine tin tacks may be used, as they will not show; the brass-headed studs are used for appearance on the outside of the chair. The lower ends of the side pieces are also drawn through to the back and a little extra stuffing pushed into the pocket so formed (J). This is necessary to avoid a gap between the back and the seat at the two outer corners, as is likely to occur when the sides of the back cover are pulled tightly through to the back of the chair. When the stuffing is smoothly in position the lower ends of the side pieces are tacked to the inside of the frame and the tacking of the ends of the tuck-in completed.

The seat cover being fitted inside out. The back cover, after being pinned, has been laid on right side out for checking.

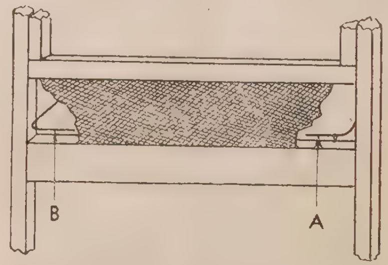
Re-covering the Back

That completes the main re-covering of the chair, and it only remains to re-tack the original or a new piece of hessian over the bottom and to cut out, turn in, and tack a piece of material to re-cover the springs at the back, unless the original cover material or 3-ply wood is in sufficiently-good condition to be used again. It should be tacked in the same position as it was originally, but be sure that all the old tack holes are covered up.

Before the chair goes back into service opportunity may be taken to oil its castors. Unwind any cotton or fluff tangled in them, oil them carefully, spinning them to spread the oil through all the bearings, then wipe off any extra oil before turning the chair right side up on the carpet.

Securing the Seat Support

At either end of the hessian at the bottom of the illustration of the back of the chair is an end of wire, that on the right (A) being stapled to the frame of the chair, but that on the left (B) being free. These are the ends of a wire support that runs round the outer edge of the seat, and they should both be fastened down firmly yet able to twist, as the seat hinges on them, as it were, when it is sat on.



It was a weak point of construction in this chair that the ends had been fastened merely with staples, which had pulled out and could not be re-fastened any more permanently because the wood had split a little and fresh staples would be likely to pull out as the original ones had done. Some more secure method of fastening them should have been used in the first place, such as looping a piece of webbing round them and tacking it back firmly to the side of the chair frame.

Should loose wires like this be encountered, they should be fastened back with webbing or with a strip of material folded lengthwise several times and machined for strength. It is important that they be secure, for if they become loose, their movement tends to wear through the material backing of the chair, or may even scratch the polished wood badly, as the right-hand one in the illustration had done before it was refastened.

The chair illustrated is fairly typical of fireside chairs that have been available for a good many years. Some may have no arms, some padded arms, but once the re-covering of a simple one like this has been accomplished it is not difficult to advance to the repairing of a more complicated one.

Hemlock is a Dangerous Weed

["*Evening Post*" *photo.*

INSTANCES in recent months of children being poisoned by hemlock have again drawn attention to the dangerous nature of this plant. A tall-growing biennial weed, hemlock is easily recognisable by its finely-divided, carrot-like leaves and the purple spots on the stems and leafy stalks.

Hemlock contains a virulent poison which has been responsible for tragic results when the plant has been handled by children. Where even one plant is growing a child's life may be endangered, so the weed should always be hoed out as soon as it is recognised.

VITAMIN C IN THE DAILY DIET

AN investigation of the story of the discovery of vitamins is in some ways similar to the study of the genealogical tree of a family. From the original crude extracts of plant and animal foods some 16 pure vitamins have been isolated and other factors, the effects and nature of which have still not been elucidated, are being investigated. Fortunately for the average person, to whom the acquisition of all this information might appear a formidable task, the members of the vitamin family—like those of many another genealogical tree—have by no means played equally-important parts in the history of human health and achievement. In this article Evelyn E. Moore, Rural Sociologist, Department of Agriculture, Auckland, discusses the part played by vitamin C in the maintenance of health and ways of obtaining the body's requirement of it.

[*Sparrow Industrial Pictures Ltd. photo.*

Salads are not necessarily good sources of vitamin C, but if they contain generous servings of tomatoes, their contribution to the vitamin C intake is valuable.

ONLY 5 vitamins need be considered when the average diet is being planned, for the others are either so widely distributed in foods or required in such small amounts that symptoms of other vitamin deficiencies will appear long before a shortage of these becomes noticeable. In fact, their discovery has been mainly the result of careful experimental work with animals fed diets consisting of a mixture of highly-purified nutrients. Even under those conditions not all animals will develop vitamin deficiencies, for some are able to make some vitamins from the foods they eat; for example, cattle can maintain excellent health on a diet from which most of the B vitamins, as well as vitamin C, are lacking.

As well as vitamin C, however, human beings must have adequate amounts of vitamin A and 3 of the B group of vitamins—B_1 or thiamine, B_2 or riboflavin, and nicotinic acid or niacin. The need for a sixth vitamin, vitamin D, was discussed in an article in the September "Journal" on calcium and other mineral requirements, for it is needed especially for normal bone growth and development.

Vitamin C or Ascorbic Acid

Of all the vitamin-deficiency diseases affecting western civilisation, perhaps scurvy, the disease caused by severe vitamin C deficiency, has caused most concern. To any country relying extensively as did England, for example, on a strong navy and mercantile fleet to maintain its prestige, any disease causing the suffering and disaster which scurvy often produced, particularly on long sea voyages, merited serious consideration.

In New Zealand also the importance of vitamin C in nutrition has received considerable publicity. New Zealanders are probably most familiar with the needs of babies, especially bottle-fed babies, for this vitamin, as treated cow's milk contains only traces of vitamin C. Consequently, from a very early age infants receive an additional supply of this vitamin, usually as orange juice, rose-hip syrup, black currant juice, or some of the vegetable juices, all of which are good sources. It is essential for adults, too, but as their diet is much more varied, and is unlikely to be entirely lacking in fresh fruit and vegetables, scurvy is much less likely to develop.

Effects of Deficiency

Though a severe deficiency of this vitamin rarely occurs in New Zealand, it is possible that cases of mild deficiency do occur. While lacking the definite symptoms characteristic of severe deficiency, these cases may show lack of appetite, lassitude, persistent fatigue, loss of weight, reduced resistance to infections, and pains in the limbs and joints, which may be wrongly attributed to rheumatism.

Its exact functions in the body have not yet been clearly established, but the symptoms of vitamin C deficiency give some indication of its action. The ability of the bone marrow cells to produce red blood cells is reduced, causing anaemia with its concomitant effects; microscopic examination of muscle and bone tissue shows that the material binding the cells together is altered in structure; and the quantity of a substance which circulates in the blood and helps protect the body against infections and bacterial toxins is considerably reduced. That has been shown clearly in experiments with guinea-pigs, the percentage of deficient animals succumbing to a standard dosage of bacterial toxin always being far greater than the percentage of normal ones. The lowered resistance to infection of infants with vitamin C deficiency has been frequently noticed.

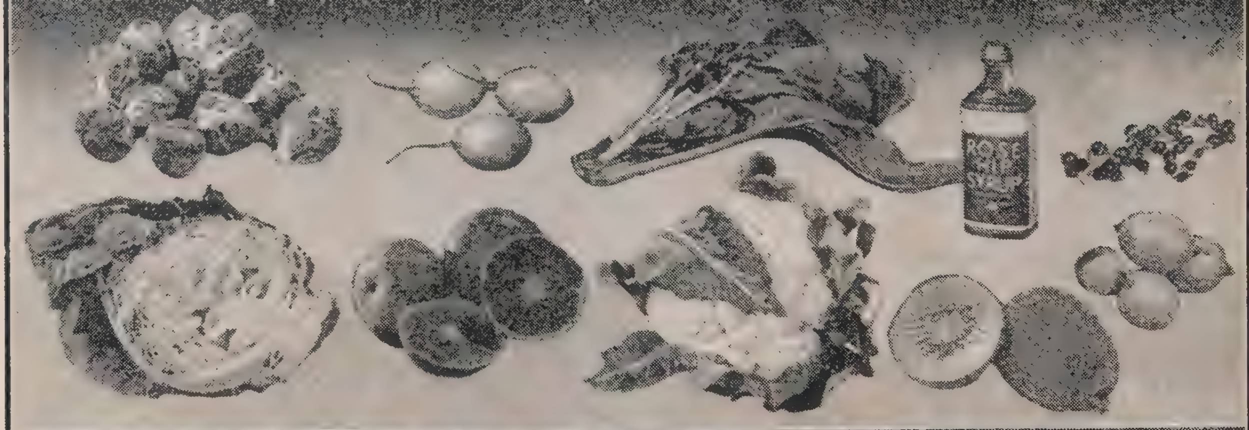
The Body's Requirement

Like that of most other nutrients, the daily consumption of vitamin C which will produce and maintain the body in the best possible health is very difficult to assess. Though the quantity which will prevent the occurrence of scurvy has been determined, the symptoms of mild deficiency and the amount that will just prevent them are more difficult to detect, especially as it is also possible that even higher intakes of vitamin C will prove of benefit by increasing resistance to disease. Consequently the authorities, including the American Medical Research Council, have set the standard for best nutrition as the amount of vitamin which will maintain the body's

Foods containing Vitamin C

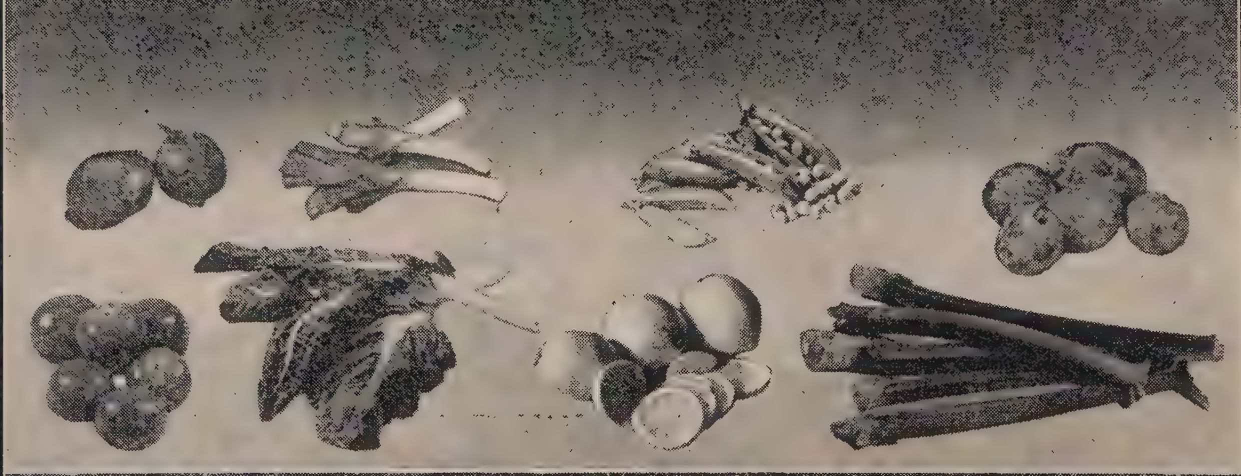
SOME EXCELLENT SOURCES

Two tablespoons of rose hip syrup, or one generous serving (3½ to 4oz.) of these foods, fresh or cooked by conservative methods, provides half or more of the daily requirement.



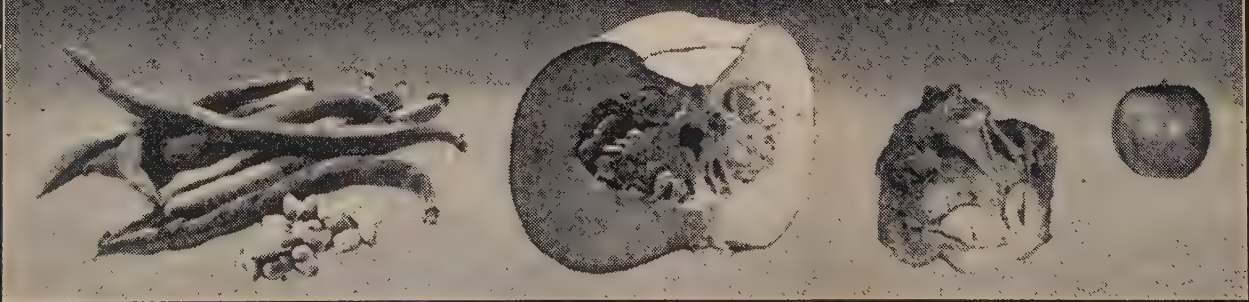
SOME VALUABLE SOURCES

These foods, because they are more readily available in many parts of New Zealand, are among the most valuable sources of the vitamin. One serving, fresh or cooked by conservative methods, provides a fifth or more of the daily requirement.



SOME USEFUL SOURCES

One serving will provide a tenth or more of the daily requirement.



[Sparrow Industrial Pictures Ltd. photos.

[*Green and Hahn Ltd. photo.*

Fresh vegetables are the only foods apart from fruit which supply vitamin C, and they are generally better sources of it. Potatoes are possibly the most reliable source of the vitamin in the average New Zealander's diet.

stores at a certain high level. Measurement of the amount of vitamin C in the blood is one way in which this is determined, for when plenty of vitamin C is contained in the diet it soon reaches and maintains a uniform concentration.

Further evidence in support of the recommended allowance is the fact that the quantity of vitamin C which will just maintain this maximum level in the blood produces a concentration in the body tissues very similar to that in animals which are able to make their own vitamin C in their bodies and presumably, therefore, maintain it at the most beneficial level, just as normal people maintain in their blood a constant percentage of glucose which is lowered only under conditions of severe starvation. As it has also been shown that any infection, even a slight cold, markedly increases the rate at which it is used, the additional stores built up are availalbe for use during this period, thus preventing the body from being seriously depleted.

Prevention of Deficiency

Severe vitamin C deficiency is a very rare disease in New Zealand, for fresh fruit is a popular food with almost everyone. However, several factors debar the average person from obtaining the necessary amount of vitamin C from fruit alone, even if it should be desirable, and that is debatable. Not only is fruit usually one of the most expensive foodstuffs, but at present the supply is not sufficient to provide everyone with their full quota of vitamin C. Varieties of fruits vary considerably in their vitamin C content, it being unfortunate that several of the more common fruits—for example, apples, pears, stone fruits, and rhubarb—are among the poorer sources of vitamin C, while several of the good sources, such as oranges, berry fruits, tree tomatoes, and Chinese gooseberries, either have a very short season or are available only in limited quantities, particularly in some parts of New Zealand.

Fresh vegetables are the only other foods supplying vitamin C, and fortunately they are generally better sources of this vitamin than fruits, though the ways in which they are cooked and served are very important factors regulating the amount of vitamin C they will provide.

Fresh fruit and vegetables should have a prominent place in every menu. To provide the most desirable amount of vitamin C, 4 or 5 average servings of fruit and vegetables should appear on the menu daily, and at least 1 serving should consist of a fruit or vegetable which is a good source of vitamin C.

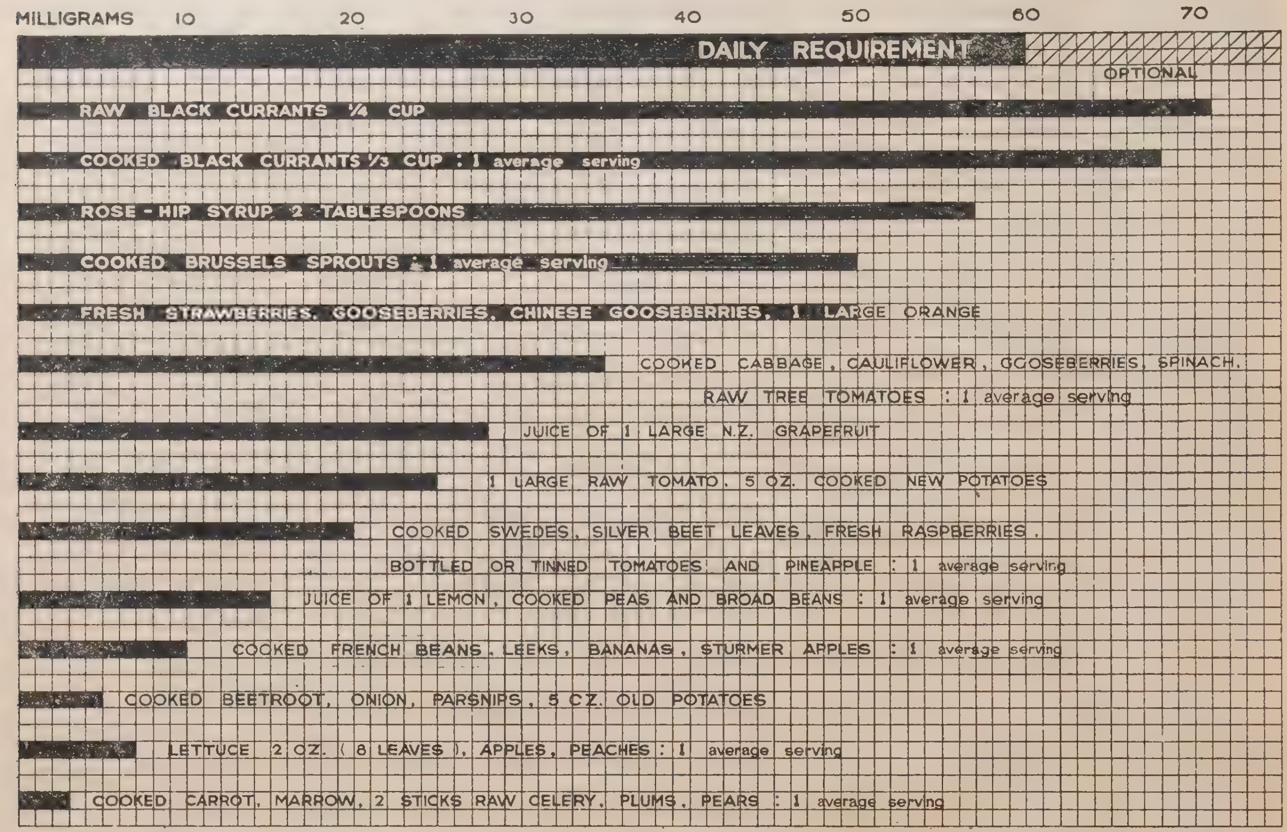
However, it is one of the least stable vitamins, and may be largely destroyed in food during the period between harvesting and service at the table of fruit and vegetables unless reasonable precautions are taken to ensure its retention. Methods and times of storage and cookery affect the vitamin content of foods considerably. Long storage, particularly under conditions where wilting will occur readily; careless treatment, so that plants are crushed and bruised; long, slow cooking; the presence of alkali (for example, baking soda) in the cooking water; and exposure of hot cooked vegetables to air all cause vitamin C to be destroyed. It also dissolves in water very readily.

Such practices as serving vegetables and keeping them hot for some time before they are to be eaten, especially if they have been cooked with soda, or cooking vegetables in more water than is necessary and then discarding it, greatly reduce the vitamin C value of the vegetables, so that they can no longer be relied on as good sources of this vitamin. Nor are vegetables which have been cooked twice (as in shepherd's pie) or scalloped vegetables reliable sources of vitamin C. Much less vitamin C is lost when fruits are cooked, because they contain acid in the presence of which this vitamin is much more stable.

Especially for those living in hotels or institutions where large-quantity cookery methods usually result in the serving of vegetables in which very little vitamin C is retained, a very good plan is to include two servings of fruit or raw vegetables in the menu every day, provided that they are not selected from those which are inherently-poor sources of vitamin C, such as pears, plums, figs, and cherries, or beetroot, carrots, and celery. Salads, incidentally, need not necessarily be a good source of vitamin C. Lettuce, though a green, leafy vegetable, provides comparatively little vitamin C in the quantity normally eaten in a salad, as an average serving contains only about 1/10 of the recommended daily allowance, and the other ingredients added to salads often are also poor or negligible sources of this vitamin. Eggs, cheese, meat, fish, raisins, and dates contain no vitamin C at all, and beetroot, cold mashed potatoes, grated raw carrot, sweet corn, and celery are all poor sources of it. However, when they contain generous servings of tomato, sliced cabbage,

PROPORTION OF AN AVERAGE ADULT'S RECOMMENDED ALLOWANCE OF VITAMIN C IN SOME COMMON FOODS

For good health 60 to 75 milligrams are required every day



radishes, and most other vegetables and fruits lettuce salads are valuable sources of vitamin C.

Cooked vegetables are good sources of this vitamin if care has been taken in their preparation and cookery—that is, if they are cooked rapidly in a minimum of boiling, salted water and served immediately. Steaming, baking, and roasting are equally good methods for suitable vegetables. All the evidence at present available indicates that vegetables cooked in pressure saucepans retain as much vitamin C as those cooked under the best possible conditions in an ordinary saucepan; in addition, there is only a very small quantity of vegetable water in which the vitamin can dissolve, and it can be used easily in soups and gravies if desired. Commercially-preserved fruits and vegetables, which are also pressure cooked, retain much of their vitamin C.

Factors Affecting Vitamin Content

There has been much controversy during the past few years about factors such as the so-called artificial and natural fertilisers, climate, soil type, variety, and storage methods which can affect the food value of plants. Some of those factors, particularly the type of fertiliser used, have no measurable or significant effect on the vitamin content. Others, such as the age of the plant, time of storage, and the season of the year, affect the food value or vitamin content of individual plants.

However, averages of vitamin content have been obtained from estimations carried out on many thousands of different plants, grown under all conditions, and the vitamin C obtained by the average New Zealand person during a year probably will rarely be so markedly lacking as to cause a severe vitamin C deficiency condition. Only under exceptional circumstances would a menu prepared with due regard for the principles of good diet planning not contain sufficient of all the nutrients required for health. These circumstances might include the consistent use of old stored and wilted vegetables, or of varieties of vegetables which have been shown to contain significantly less food value than the average for the species; these are rare, white carrots with no vitamin A value compared with normal carrots, which are an excellent source of this vitamin, being perhaps the most notable.

Obtaining the Daily Requirement

Potatoes are possibly the most reliable source of vitamin C in the average New Zealander's diet, for they appear on the menu daily and are eaten in considerable amounts. An average serving of new potatoes is estimated to provide about 1/3 of the daily requirement. The vitamin is gradually lost during storage, so that old potatoes may provide only 1/6 or less of the allowance. An average serving of root vegetables or pumpkin contains another 1/6. Half a cup of cooked green, leafy vegetables such as spinach, silver beet, cabbage, brussels sprouts, peas, or beans will provide about 1/3 of the requirement.

An average serving of fruits which are good sources of vitamin C, such as oranges, berry fruits, passion fruit, pineapples, tree tomatoes, and Chinese gooseberries, contains at least ½ the allowance; fruits which are rated as average sources of vitamin C, such as apples, bananas, peaches, and rhubarb, provide about 1/7, and fruits which are poor sources, such as pears, plums, grapes, and figs, 1/14 or less.

Therefore, by following the general principles of good menu planning, as well as those practices which result in the serving of attractive meals, a good supply of vitamin C in the diet will also be ensured.

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Order and Routine in Household Tasks

IN a factory, where a person may repeat an operation throughout the working day, and for all the working days of the year, it is easy to see how "practice makes perfect." The housewife, with her multitude of different tasks, has less opportunity to attain perfection in each. Yet, by consciously examining her planning and methods of work, she can often see some way of running her household more smoothly or of doing some task more easily. In this article Edith G. McNab, Rural Sociologist, Department of Agriculture, Dunedin, offers advice on the development of order and routine.

A WOMAN who is experiencing sole-charge housekeeping for the first time will find such a multiplicity of details with which to cope that, unless they can be reduced to some system, they will be overwhelming. An experienced housekeeper will always work to some sort of routine, even though it has been evolved unconsciously. Her system may have no other basis than that of custom—custom which has grown up without any particular thought being given to it. Often even an experienced homemaker can reduce the time and energy spent on her work by taking stock of the situation and planning a new routine. That will require some effort to begin, for old habits are hard to break, but if the effort will lead to greater efficiency for the worker and to greater satisfaction for the household, it will be well worth making.

The woman who has worked out a suitable routine has an advantage over one who has not done so. She will have a feeling of confidence and will derive more pleasure from her work through knowing that she has everything under control. The woman who depends on the inspiration of the moment will work more slowly and laboriously, wasting much time and effort in confusion and indecision. For the same amount of work accomplished she is likely to be more fatigued at the end of the day than the woman who works to a plan. It is only too easy for the housewife to overlook the benefits of long-range planning in dealing with the problems of the moment.

No homemaker can afford to let herself become merely the household drudge without impoverishing the group life of her family. To see that she has her fair share of rest and recreation so that her own health and strength are maintained is a duty to the rest of the family as much as to herself.

Developing a Routine

Though a day's housekeeping involves a variety of tasks, most of them have to be repeated day after day. That gives the housewife an opportunity to try different arrangements of her work until she finds some routine which is in harmony with the family circumstances and enables her to do all that is necessary at the lowest possible cost of time and fatigue.

The situation varies so much from household to household that each homemaker must develop her own routine; she cannot simply be guided by her neighbour's practice and expect it to work as well in her own case. Nor are two human beings ever exactly alike in their reactions to a situation; methods which suit one worker perfectly may not suit another at all. The best plan for one homemaker and household is most unlikely to prove equally good for another.

. . . extra calls on the telephone . . .

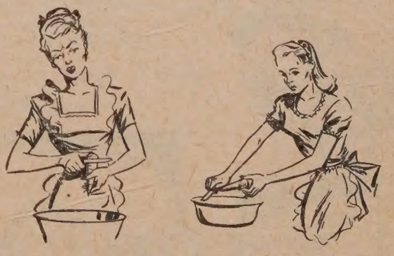
The best order of work at the moment will not remain the best always, for conditions in a household are never completely static. As children grow up, as the seasons change, the housewife must adapt her routine to the altered needs if she is to retain her efficiency. Daily routine must have a certain flexibility, for every household has its days when there are unexpected visitors, extra calls on the telephone, or the small mishaps which occur even in the best-regulated homes.

Forming New Habits

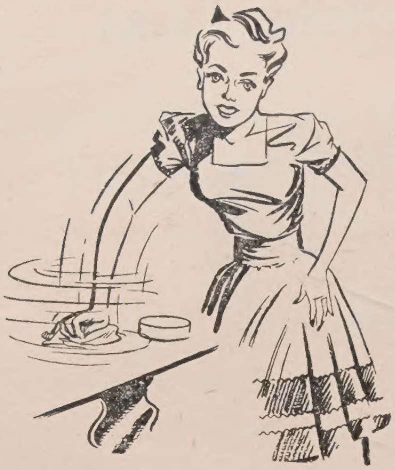
Habit is frequently the greatest obstacle to a change in the existing order of the day or in the way of doing a particular task. Once a habit is formed the stimulus of beginning the accustomed routine is sufficient to carry it on almost automatically. Decisions do not have to be made at each step in the process. This has the advantage of reducing the effort needed to carry out the work, but it makes a change in routine difficult. Habit is "a good servant but a bad master." An appreciation of the difficulties involved in altering an established routine will help to ease the transition between breaking the old habit and forming the new.

In learning a new method mistakes are made and delays, fatigue, and a feeling of awkwardness are experienced. As difficulties arise decisions must be made, and constant attention is required. When the first interest of making the new departure wears off attention may lapse and it is easy to slip back into the old habits and conclude that, after all, they are the best. At this time a clear conception of the goal toward which she is working will spur the housewife on. The goal may be a better fulfilling of the needs of the family, more satisfaction from the work in easier operation or in improved results, or more leisure for the worker. Once the new method is judged to be worth trying, perseverance through the discouraging and awkward stage of learning will lead to the development of new skills in performance. A new habit is formed, and once again operations are carried on smoothly and easily, with little conscious control required.

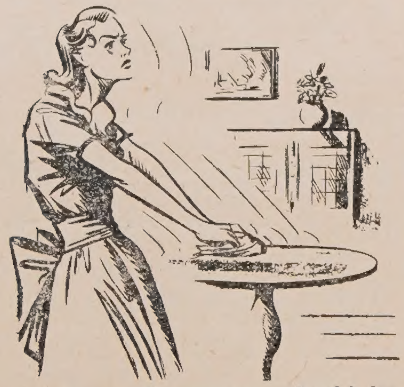
Knowing the difficulties of breaking old habits and forming new ones, it behoves the worker to be particularly careful to eliminate aimless movements before developing a new routine.



When a new method is being learnt constant attention is necessary. The slow method of scraping a carrot on the right wastes energy; the other way is more efficient.



Polishing with a circular movement needs less effort than a back-and-forward motion.

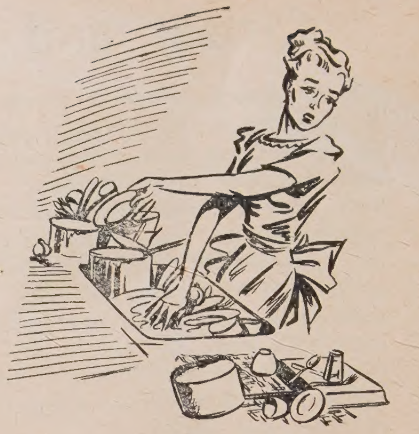


Each step in the process should be evaluated. Is it really necessary? Purposeless motions are only a waste of energy, it is not easy to be critical of one's own performance, but alert observation of each step will reduce wasted movements. Does it lead on smoothly to the next one? A forceful change wastes both time and energy. Less fatigue results from a continuous movement than from one which involves a change of direction. For example, polishing or washing a surface with a circular movement is more economical of effort than a back-and-forward motion.

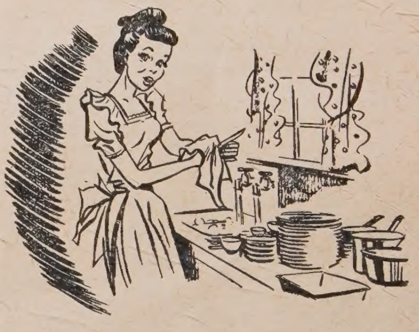
The order in which tasks are done has an important influence on the amounts of time and energy expended by the housewife in a day's work. Most of the homemaker's time is spent on routine tasks—those which must be done every day, such as preparing meals, cleaning, and tidying; or every week, such as washing and mending. Grouping together tasks which require the same type of activity saves time and energy and reduces fatigue. After a change to another kind of work a period of "warming up" is needed before the peak of efficiency is reached. At this stage the worker is well adjusted to performance of the task, and it is carried on with less effort than in the preliminary stages. Repetition of the same sort of action sets up a rhythm, and rhythmic motions are less tiring, for each repetition makes the succeeding one easier. Grouping of similar tasks also reduces handling of tools and materials, saving time in preparing for the work and in clearing up afterward. Thus it is wise to plan to do the same kind of tasks one after the other, without breaking the sequence by introducing tasks requiring different types of activities. The one "warming-up" period will then serve for the whole group of similar tasks.

This economy can be applied to the arrangement of the tasks over the day and the week. It is easier to wash the kitchen floor, the tiled hearth, and the porch one after the other than with other tasks sandwiched between. Dish washing is speeded up if the dishes are scraped and stacked before washing is begun, for then there are no breaks in the rhythm of washing. Menus may be so planned that at least part of the preparation for two meals may be carried out at the same time. Similarly, time and energy can be saved by grouping like tasks as far as possible on one day of the week, so reducing the frequency of the changes from one kind of work to another.

Eventually, long-continued action of the same type will give rise to fatigue. This leads to breaks in the continuity and to poorer control of motion by the worker. Work in a household is made up of such a variety of tasks that, even when they are grouped according to the type of activity, the housewife is not likely to have to carry on any one to the stage of fatigue.



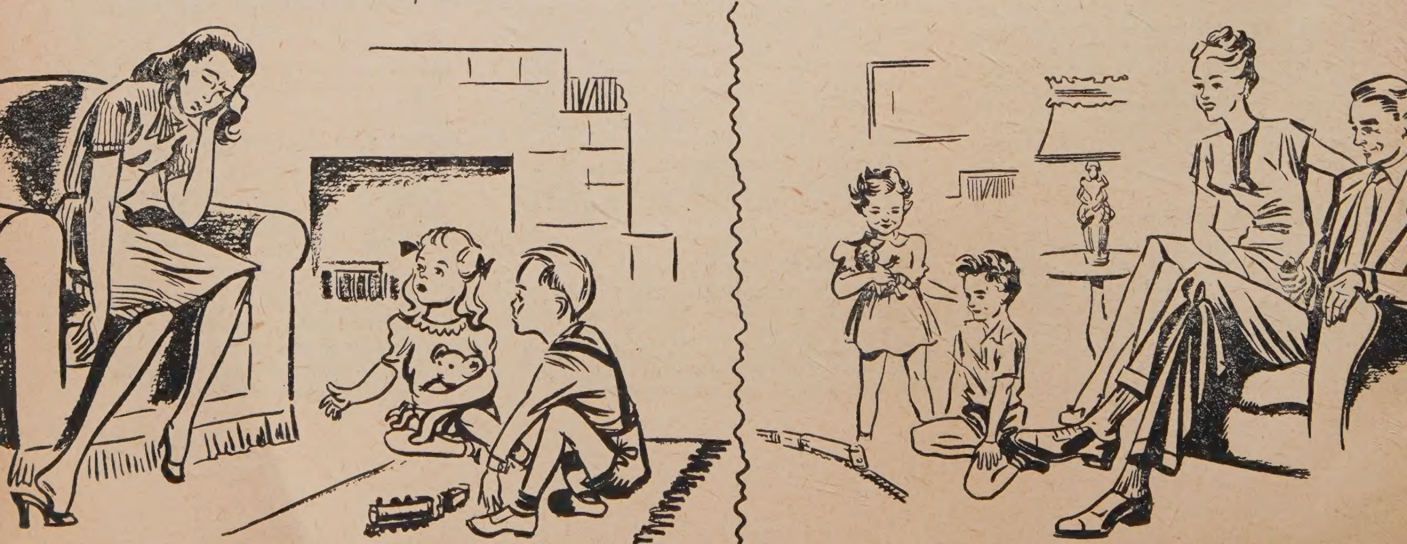
Order can take much of the unpleasantness out of a task such as dish washing.



It is common knowledge that a lack of order in any kind of situation involves the worker in extra wear and tear. Human beings are creatures of habit, and the housewife can economise her time and energy by working out a routine suited to her own situation.

Routine should not be followed blindly, but should be sufficiently flexible to allow for day-to-day variations in the circumstances without throwing the whole system out of gear. In assessing the value of any plan it must be remembered that it is only a means to an end. Routine should not rule, but should be directed toward promoting the most harmonious and satisfying living of the family as a whole.

Working to a plan helps to ensure that a mother has time to relax with the family and is not "too tired to bother" at the end of the day.



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